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Encyclopædia Britannica.

Parthia.

1 Ancient diviſions.

PARTHIA, a celebrated empire of antiquity, bounded on the weſt by Media, on the north by Hyrcania, on the eaſt by Aria, on the ſouth by Carmania the deſert; ſurrounded on every ſide by mountains, which ſtill ſerve as a boundary, though its name is now changed, having obtained that of *Eyrac* or *Arac*; and, to diſtinguiſh it from Chaldæa, that of *Eyrac Agami*. By Ptolemy it is divided into five diſtricts, viz. Caminſine, or Gamiſene, Partheyne, Choroane, Atticene, and Tabiene. The ancient geographers enumerate a great many cities in this country. Ptolemy in particular reckons 25 large cities; and it certainly muſt have been very populous, ſince we have accounts of 2000 villages, beſides a number of cities, which were deſtroyed by earthquakes. Its capital was named *Hecatompolis*, from the circumſtance of its having 100 gates. It was a noble and magnificent place; and, according to ſome, it ſtill remains under the name of *Iſpahan*, the capital of the preſent Perſian empire.

2 Whence peopled.

Parthia is by ſome ſuppoſed to have been firſt peopled by the Phetri or Pathri, often mentioned in Scripture, and that the Parthians are deſcended from Pathruſim the ſon of Miſraim. But however true this may be with regard to the ancient inhabitants, yet it is certain, that thoſe Parthians who were ſo famous in hiſtory, deſcended from the Scythians, though from what tribe we are not certainly informed.

3 Cauſe of the Parthians revolt from Antiochus Theus.

The hiſtory of the ancient Parthians is totally loſt. All that we knew about them is, that they were firſt ſubject to the Medes, afterwards to the Perſians, and laſtly to Alexander the Great. After his death the province fell to Seleucus Nicator, and was held by him and his ſucceſſors till the reign of Antiochus Theus, about the year 250 before Chriſt. At this time the Parthians revolted, and choſe one Arſaces for their king. The immediate cauſe of this revolt was the lewdneſs of Agathocles, to whom Antiochus had committed the care of all the provinces beyond the Euphrates. This man made an infamous attempt on Tiridates, a youth of great beauty; which ſo enraged his brother Arſaces, that he excited his countrymen to revolt; and before Antiochus had leiſure to attend to the rebellion, it became too powerful to be cruſhed. Seleucus Callinicus, the ſucceſſor of Antiochus Theus, attempted to reduce Arſaces; but the latter having had ſo much time to ſtrengthen himſelf, defeated and drove his antagoniſt out of the country. Seleucus, however, in a ſhort time, undertook another expedition againſt Arſaces; but was ſtill more unfortunate than he had been in the former, being not only defeated in a great battle, but taken priſoner, and died in captivity. The day on which Arſaces gained this victory was ever after obſerved among the Parthians as an extraordinary feſtival. Arſaces being thus fully eſtabliſhed in his new kingdom, reduced Hyrcania and ſome other provinces under his power; and was at laſt killed in a battle againſt Ariarathes IV. king of Cappadocia. From this prince all the other kings of Parthia took the ſurname of *Arſaces*, as thoſe of Egypt did that of *Ptolemy*, from Ptolemy Soter.

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Arſaces I. was ſucceeded by his ſon Arſaces II. who, entering Media, made himſelf maſter of that country, while Antiochus the Great was engaged in war with Ptolemy Euergetes king of Egypt. Antiochus, however, was no ſooner diſengaged from that war, than he marched with all his forces againſt Arſaces, and at firſt drove him quite out of Media. But he ſoon returned with an army of 100,000 foot and 20,000 horſe, with which he put a ſtop to the further progreſs of Antiochus; and a treaty was ſoon after concluded, in which it was agreed, that Arſaces ſhould remain maſter of Parthia and Hyrcania, upon condition of his aſſiſting him in his wars with other nations.

4 Conqueſts of the Parthian monarchs.

Arſaces II. was ſucceeded by his ſon Priapatius, who reigned 15 years, and left three ſons, Phraates, Mithridates, and Artabanus. Phraates, the elder, ſucceeded to the throne, and reduced under his ſubjection the Mardi, who had never been conquered by any but Alexander the Great. After him, his brother Mithridates was inveſted with the regal dignity. He reduced the Bactrians, Medes, Perſians, Elymeans, and overran in a manner all the eaſt, penetrating beyond the boundaries of Alexander's conqueſts. Demetrius Nicator, who then reigned in Syria, endeavoured to recover thoſe provinces; but his army was entirely deſtroyed, and himſelf taken priſoner, in which ſtate he remained till his death; after which victory Mithridates made himſelf maſter of Babylonia and Meſopotamia, ſo that all the provinces between the Euphrates and the Ganges were now ſubject to his power.

5 Antiochus Sidetes deſtroyed with his whole army.

Mithridates died in the 37th year of his reign, and left the throne to his ſon Phrahates II. who was ſcarce ſettled in his kingdom when Antiochus Sidetes marched againſt him at the head of a numerous army, under pretence of delivering his brother Demetrius, who was ſtill in captivity. Phrahates was defeated in three pitched

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pitched battles; in conſequence of which he loſt all the countries conquered by his father, and was reduced within the limits of the ancient Parthian kingdom. Antiochus did not, however, long enjoy his good fortune; for his army, on account of their number, amounting to no fewer than 400,000, being obliged to ſeparate to ſuch diſtances as prevented them, in caſe of any ſudden attack, from joining together, the inhabitants, whom they had moſt cruelly oppreſſed, taking advantage of this ſeparation, conſpired with the Parthians to deſtroy them. This was accordingly executed; and the vaſt army of Antiochus, with the monarch himſelf, were ſlaughtered in one day, ſcarcely a ſingle perſon eſcaping to carry the news to Syria. Phrahates, elated with this ſucceſs, propoſed to invade Syria; but in the mean time, happening to quarrel with the Scythians, he was by them cut off with his whole army, and was ſucceeded by his uncle Artabanus.

The new king enjoyed his dignity but a very ſhort time, being, a few days after his acceſſion, killed in another battle with the Scythians. He was ſucceeded by Pacorus I. who entered into an alliance with the Romans; and he by Phrahates III. This monarch took under his protection Tigranes the ſon of Tigranes the Great, king of Armenia, gave him his daughter in marriage, and invaded the kingdom with a deſign to place the ſon on the throne of Armenia; but on the approach of Pompey he thought proper to retire, and ſoon after ſolemnly renewed the treaty with the Romans.

6 Alliance concluded with the Romans.

Phrahates was murdered by his children Mithridates and Orodes; and ſoon after the former was put to death by his brother, who thus became ſole maſter of the Parthian empire. In his reign happened the memorable war with the Romans under Craſſus. This was occaſioned not by any breach of treaty on the ſide of the Parthians, but through the ſhameful avarice of Craſſus. The whole Roman empire at that time had been divided between Cæſar, Pompey, and Craſſus; and by virtue of that partition, the eaſtern provinces had fallen to the lot of Craſſus. No ſooner was he inveſted with this dignity, than he reſolved to carry the war into Parthia, in order to enrich himſelf with the ſpoils of that people, who were then looked upon to be very wealthy. Some of the tribunes oppoſed him, as the Parthians had religiouſly obſerved the treaty; but Craſſus having, by the aſſiſtance of Pompey, carried every thing before him, left Rome in the year 55 B. C. and purſued his march to Brunduſium, where he immediately embarked his troops, though the wind blew very high; and after a difficult paſſage, where he loſt many of his ſhips, he reached the ports of Galatia.

7 Craſſus reſolves on a war with the Parthians.

8 Plunders the temple at Jeruſalem.

From Galatia Craſſus haſtened to Syria, and paſſing through Judea, plundered the temple at Jeruſalem in his way. He then marched with as great expedition as he could to the river Euphrates, which he croſſed on a bridge of boats: and, entering the Parthian dominions, began hoſtilities. As the enemy had not expected an invaſion, they were quite unprepared for reſiſtance; and therefore Craſſus overran all Meſopotamia; and if he had taken advantage of the conſternation which the Parthians were in, might have alſo reduced Babylonia. But inſtead of this, early in the autumn, he repaſſed the Euphrates, leaving only 7000 foot and 1000 horſe to garriſon the places he had reduced; and putting his army into winter quarters in Syria, gave himſelf totally up to his favourite paſſion of amaſſing money.

Early in the ſpring, the Roman general drew his forces out of their winter quarters, in order to purſue the war with vigour; but, during the winter, Orodes had collected a very numerous army, and was well prepared to oppoſe him. Before he entered upon action, however, the Parthian monarch ſent ambaſſadors to Craſſus, in order to expoſtulate with him on his injuſtice in attacking an ally of the Roman empire; but Craſſus, without attending to what they ſaid, only returned for anſwer, that "they ſhould have his anſwer at Seleucia."

Orodes, finding that a war was unavoidable, divided his army into two bodies. One he commanded in perſon, and marched toward Armenia, in order to oppoſe the king of that country, who had raiſed a conſiderable army to aſſiſt the Romans. The other he ſent into Meſopotamia, under the command of Surena or Surenas, a moſt experienced general, by whoſe conduct all the cities which Craſſus had reduced were quickly retaken. On this ſome Roman ſoldiers who made their eſcape, and fled to the camp of Craſſus, filled the mind of his army with terror at the accounts of the number, power, and ſtrength, of the enemy. They told their fellow ſoldiers, that the Parthians were very numerous, brave, and well diſciplined; that it was impoſſible to overtake them when they fled, or eſcape them when they purſued; that their defenſive weapons were proof againſt the Roman darts, and their offenſive weapons ſo ſharp, that no buckler could reſiſt them, &c. Craſſus looked upon all this only as the effect of cowardice: but the common ſoldiers, and even many of the chief officers, were ſo diſheartened, that Caſſius, the ſame who afterwards conſpired againſt Cæſar, and moſt of the legionary tribunes, adviſed Craſſus to ſuſpend his march, and conſider better of the enterpriſe before he proceeded farther in it. But Craſſus obſtinately perſiſted in his former reſolution, being encouraged by the arrival of Artabazus king of Armenia, who brought with him 6000 horſe, and promiſed to ſend 10,000 cuiraſſiers and 30,000 foot, whenever he ſhould ſtand in need of them. At the ſame time, he adviſed him by no means to march his army through the plains of Meſopotamia, but to take his route over the mountains of Armenia. He told him, that as Armenia was a mountainous country, the enemy's cavalry, in which their main ſtrength conſiſted, would there be entirely uſeleſs; and beſides, his army would there be plentifully ſupplied with all manner of neceſſaries; whereas, if he marched by the way of Meſopotamia, he would be perpetually haraſſed by the Parthian horſe, and frequently be obliged to lead his army through ſandy deſerts, where he would be diſtreſſed for want of water and all other proviſions. This ſalutary advice, however, was rejected, and Craſſus entered Meſopotamia with an army of about 40,000 men.

9 His ſoldiers diſheartened.

The Romans had no ſooner croſſed the Euphrates, than Caſſius adviſed his general to advance to ſome of thoſe towns in which the garriſons yet remained, in order to halt and refreſh his troops: or if he did not chooſe to follow this advice, he ſaid that his beſt way would be to march along the banks of the Euphrates to Seleucia;

cia; as by this method he would prevent the Parthians from ſurrounding him, at the ſame time he would be plentifully ſupplied with proviſions from his ſhips. Of this advice Craſſus ſeemed to approve; but was diſſuaded by Abgarus king of Edeſſa, whom the Romans took for an ally, but who was in reality a traitor ſent by Surenas to bring about the deſtruction of the Roman army.

10 Betrayed by Abgarus king of Edeſſa.

Under the conduct of this faithleſs guide, the Romans entered a vaſt green plain divided by many rivulets. Their march proved very eaſy through this fine country; but the farther they advanced, the worſe the roads became, inſomuch that they were at laſt obliged to climb up rocky mountains, which brought them to a dry and ſandy plain, where they could neither find food to ſatisfy their hunger, nor water to quench their thirſt. Abgarus then began to be ſuſpected by the tribunes and other officers, who earneſtly entreated Craſſus not to follow him any longer, but to retreat to the mountains; at the ſame time an expreſs arrived from Artabazus, acquainting the Roman general that Orodes had invaded his dominions with a great army, and that he was obliged to keep his troops at home, in order to defend his own dominions. The ſame meſſenger adviſed Craſſus in his maſter's name to avoid by all means the barren plains, where his army would certainly periſh with hunger and fatigue, and by all means to approach Armenia, that they might join their forces againſt the common enemy. But all was to no purpoſe; Craſſus, inſtead of hearkening either to the advice of the king or his own officers, firſt flew into a violent paſſion with the meſſengers of Artabazus, and then told his troops, that they were not to expect the delights of Campania in the moſt remote parts of the world.

Thus they continued their march for ſome days croſs a deſert, the very ſight of which was ſufficient to throw them into the utmoſt deſpair: for they could not perceive, either near them or at a diſtance, the leaſt tree, plant, or brook, not ſo much as a hill, or a ſingle blade of graſs; nothing was to be ſeen all around them but huge heaps of burning ſand. The Romans had ſcarcely got through this deſert, when word was brought them by their ſcouts, that a numerous army of Parthians was advancing full march to attack them; for Abgarus, under pretence of going out on parties, had often conferred with Surenas, and concerted meaſures with him for deſtroying the Roman army. Upon this advice, which occaſioned great confuſion in the camp, the Romans being quite exhauſted and tired out with their long and troubleſome march, Craſſus drew up his men in battalia, following at firſt the advice of Caſſius, who was for extending the infantry as wide as poſſible, that they might take up the more ground, and by that means prevent the enemy from ſurrounding them: but Abgarus aſſuring the proconſul that the Parthian forces were not ſo numerous as was repreſented, he changed this diſpoſition, and believing only the man who betrayed him, drew up his troops in a ſquare, which faced every way, and had on each ſide 12 cohorts in front. Near each cohort he placed a troop of horſe to ſupport them, that they might charge with the greater ſecurity and boldneſs. Thus the whole army looked more like one phalanx than troops drawn up in manipuli, with ſpaces between them, after the Roman manner. The general himſelf commanded in the centre, his ſon in the left wing, and Caſſius in the right.

In this order they advanced to the banks of a ſmall river called the *Baliſſus*, the ſight of which was very pleaſing to the ſoldiers, who were much haraſſed with drought and exceſſive heat. Moſt of the officers were for encamping on the banks of this river, or rather rivulet, to give the troops time to refreſh themſelves after the fatigues of ſo long and painful a march; and, in the mean time, to procure certain intelligence of the number and diſpoſition of the Parthian army; but Craſſus, ſuffering himſelf to be hurried on by the inconſiderate ardour of his ſon, and the horſe he commanded, only allowed the legions to take a meal ſtanding; and before this could be done by all, he ordered them to advance, not ſlowly, and halting now and then, after the Roman manner, but as faſt as they could move, till they came in ſight of the enemy, who, contrary to their expectation, did not appear either ſo numerous or ſo terrible as they had been repreſented; but this was a ſtratagem of Surenas, who had concealed his men in convenient places, ordering them to cover their arms, leſt their brightneſs ſhould betray them, and, ſtarting up at the firſt ſignal, to attack the enemy on all ſides. The ſtratagem had the deſired effect; for Surenas no ſooner gave the ſignal, than the Parthians, riſing as it were out of the ground, with dreadful cries, and a moſt frightful noiſe, advanced againſt the Romans, who were greatly ſurpriſed and diſmayed at the ſight; and much more ſo, when the Parthians, throwing off the covering of their arms, appeared in ſhining cuiraſſes, and helmets of burniſhed ſteel, finely mounted on horſes covered all over with armour of the ſame metal. At their head appeared young Surenas in a rich dreſs, who was the firſt who charged the enemy, endeavouring, with his pikemen, to break through the firſt ranks of the Roman army; but finding it too cloſe and impenetrable, the cohorts ſupporting each other, he fell back, and retired in a ſeeming confuſion: but the Romans were much ſurpriſed when they ſaw themſelves ſuddenly ſurrounded on all ſides, and galled with continual ſhowers of arrows. Craſſus ordered his light-armed foot and archers to advance, and charge the enemy; but they were ſoon repulſed, and forced to cover themſelves behind the heavy-armed foot. Then the Parthian horſe, advanced near the Romans, diſcharged ſhowers of arrows upon them, every one of which did execution, the legionaries being drawn up in ſuch cloſe order, that it was impoſſible for the enemy to miſs their aim. As their arrows were of an extraordinary weight, and diſcharged with incredible force and impetuoſity, nothing was proof againſt them. The two wings advanced in good order to repulſe them, but to no effect; for the Parthians ſhot their arrows with as great dexterity when their backs were turned, as when they faced the enemy; ſo that the Romans, whether they kept their ground, or purſued the flying enemy, were equally annoyed with their fatal arrows.

11 The battle of Carrhæ.

The Romans, as long as they had any hopes that the Parthians, after having ſpent their arrows, would either betake themſelves to flight, or engage them hand to hand, ſtood their ground with great reſolution and intrepidity; but when they obſerved that there were a great many camels in their rear loaded with arrows, and that thoſe who emptied their quivers wheeled about to fill them

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them anew, they began to lose courage, and loudly to complain of their general for suffering them thus to stand still, and serve only as a butt to the enemy's arrows, which, they well saw, would not be exhausted till they were all killed to a man. Hereupon Crassus ordered his son to advance, at all adventures, and attack the enemy with 1300 horse, 500 archers, and 8 cohorts. But the Parthians no sooner saw this choice body (for it was the flower of the army) marching up against them, than they wheeled about, and betook themselves, according to their custom, to flight. Hereupon young Crassus, crying out as loud as he could, *They fly before us*, pushed on full speed after them, not doubting but he should gain a complete victory; but when he was at a great distance from the main body of the Roman army, he perceived his mistake; for those who before had fled, facing about, charged him with incredible fury. Young Crassus ordered his troops to halt, hoping that the enemy, upon seeing their small number, would not be afraid to come to a close fight: but herein he was likewise greatly disappointed; for the Parthians, contenting themselves to oppose his front with their heavy-armed horse, surrounded him on all sides; and, keeping at a distance, discharged incessant showers of arrows upon the unfortunate Romans, thus surrounded and pent up. The Parthian army, in wheeling about, raised so thick a dust, that the Romans could scarce see one another, much less the enemy: nevertheless, they found themselves wounded with arrows, though they could not perceive whence they came. In a short time the place where they stood was all strown with dead bodies.

12 Extreme distress of the Romans.

Some of the unhappy Romans finding their entrails torn, and many overcome by the exquisite torments they suffered, rolled themselves in the sand with the arrows in their bodies, and expired in that manner. Others endeavouring to tear out by force the bearded points of the arrows, only made the wounds the larger, and increased their pain. Most of them died in this manner; and those who outlived their companions were no more in a condition to act; for when young Crassus exhorted them to march up to the enemy, some showed him their wounded bodies, others their hands nailed to their bucklers, and some their feet pierced through and pinned to the ground; so that it was equally impossible for them either to attack the enemy or defend themselves. The young commander, therefore, leaving his infantry to the mercy of the enemy, advanced at the head of the cavalry against their heavy-armed horse. The thousand Gauls whom he had brought with him from the west, charged the enemy with incredible boldness and vigour; but their lances did little execution on men armed with cuirasses, and horses covered with tried armour: however, they behaved with great resolution; for some of them taking hold of the enemy's spears, and closing with them, threw them off their horses on the ground, where they lay without being able to stir, by reason of the great weight of their armour; others, dismounting, crept under the enemy's horses, and thrusting their swords into their bellies, made them throw their riders. Thus the brave Gauls fought, though greatly harassed with heat and thirst, which they were not accustomed to bear, till most of their horses were killed, and their commander dangerously wounded. They then thought it adviseable to retire to their infantry, which they no sooner joined, than the Parthians invested them anew, making a most dreadful havock of them with their arrows. In this desperate condition, Crassus, spying a rising ground at a small distance, led the remains of his detachment thither, with a design to defend himself in the best manner he could, till succours should be sent him from his father. The Parthians pursued him; and having surrounded him in his new post, continued showering arrows upon his men, till most of them were either killed or disabled, without being able to make use of their arms, or give the enemy proofs of their valour.

Young Crassus had two Greeks with him, who had settled in the city of Carrhæ. These, touched with compassion, at seeing so brave a man reduced to such straits, pressed him to retire with them to the neighbouring city of Ischnes, which had declared for the Romans; but the young Roman rejected their proposal with indignation, telling them, that he would rather die a thousand times than abandon so many valiant men, who sacrificed their lives for his sake. Having returned this answer to his two Greek friends, he embraced and dismissed them, giving them leave to retire and shift for themselves in the best manner they could. As for himself, having now lost all hopes of being relieved, and seeing most of his men and friends killed round him, he gave way to his grief; and, not being able to make use of his arm, which was shot through with a large barbed arrow, he presented his side to one of his attendants, and ordered him to put an end to his unhappy life. His example was followed by Censorius a senator, by Megabacchus an experienced and brave officer, and by most of the nobility who served under him. Five hundred common soldiers were taken prisoners, and the rest cut in pieces.

13 The death of young Crassus.

The Parthians, having thus cut off or taken the whole detachment commanded by young Crassus, marched without delay against his father, who, upon the first advice that the enemy fled before his son, and were closely pursued by him, had taken heart, the more because those who had remained to make head against him seemed to abate much of their ardour, the greatest part of them having marched with the rest against his son. Wherefore, having encouraged his troops, he had retired to a small hill in his rear, to wait there till his son returned from the pursuit. Young Crassus had despatched frequent expresses to his father, to acquaint him with the danger he was in; but they had fallen into the enemy's hands, and been by them put to the sword: only the last, who had escaped with great difficulty, arrived safe, and informed him that his son was lost if he did not send him an immediate and powerful reinforcement. This news threw Crassus into the utmost consternation; a thousand affecting thoughts rose in his mind, and disturbed his reason to such a degree, that he scarce knew what he was doing. However, the desire he had of saving his son, and so many brave Romans who were under his command, made him immediately decamp, and march to their assistance; but he was not gone far before he was met by the Parthians, who, with loud shouts, and songs of victory, gave, at a distance, the unhappy father notice of his misfortune. They had cut off young Crassus's head, and, having fixed it on the point of a lance, were advancing full speed to fall on the father. As they

drew

Parthia. drew near, Craffus was ftruck with that difmal and affecting fight; but on this occafion, behaved like a hero: for though he was under the deepeft concern, he had the prefence of mind to ftifle his grief, for fear of difcouraging the army, and to cry out to the difmayed troops, "This misfortune is entirely mine; the lofs of one man cannot affect the victory: Let us charge, let us fight like Romans: if you have any compaffion for a father who has juft now loft a fon whofe valour you admired, let it appear in your rage and refentment againft thefe infulting barbarians." Thus Craffus ftrove to reanimate his troops; but his efforts were unfuccefsful: their courage was quite funk, as appeared from the faint and languifhing fhout which they raifed, according to cuftom, before the action. When the fignal was given, the Parthians, keeping to their old way of fighting, difcharged clouds of arrows on the legionaries, without drawing near them; which did fuch dreadful execution, that many of the Romans, to avoid the arrows, which occafioned a long and painful death, threw themfelves, like men in defpair, on the enemy's heavy-armed horfe, feeking from their fpears a more quick and eafy kind of death. Thus the Parthians continued plying them inceffantly with their arrows till night, when they left the field of battle, crying out, that they would allow the father one night to lament the death of his fon.

14 Diftrefs of Craffus. This was a melancholy night for the Romans. Craffus kept himfelf concealed from the foldiery, lying not in the general's tent, but in the open air, and on the bare ground, with his head wrapped up in his paludamentum or military cloak; and was, in that forlorn condition, fays Plutarch, a great example to the vulgar, of the inftability of fortune; to the wife, a ftill greater of the pernicious effects of avarice, temerity, and ambition. Octavius, one of his lieutenants, and Caffius, approached him, and endeavoured to raife him up and confole him: but, feeing him quite funk under the weight of his affliction, and deaf to all comfort, they fummoned a council of war, compofed of all the chief officers; wherein it was unanimoufly refolved, that they fhould decamp before break of day, and retire, without found of trumpet, to the neighbouring city of Carrhæ, which was held by a Roman garrifon. Agreeable to this refolution, they began their march as foon as the council broke up; which produced dreadful outcries among the fick and wounded, who, perceiving that they were to be abandoned to the mercy of the enemy, filled the camp with their complaints and lamentations: but their cries and tears, though very affecting, did not ftop the march of the others, which, indeed, was very flow, to give the ftragglers time to come up. There were only 300 light horfe, under the command of one Ægnatius, who purfued their march without ftopping. Thefe arriving at Carrhæ about midnight, Ægnatius, calling to the centinels on the walls, defired them to acquaint Coponius, the governor of the place, that Craffus had fought a great battle with the Parthians; and, without faying a word more, or letting him know who he was, continued his march with all poffible expedition to the bridge of Zeugma; which he paffed, and by that means faved his troops, but was much blamed for thus abandoning his general.

The meffage which he fent to Coponius was of fome temporary fervice to Craffus. For that commander, wifely conjecturing, from the manner in which the unknown perfon had given him the intelligence, that fome misfortune had befallen Craffus, immediately ordered his garrifon to ftand to their arms; and, marching out, met Craffus, and conducted him and his army into the city: for the Parthians, though informed of his flight, did not offer to purfue him, obferving therein the fuperftitious cuftom which obtained among them and the Perfians, not to fight in the night; but when it was day, they entered the Roman camp, and having put all the wounded, to the number of 4000, to the fword, difperfed their cavalry all over the plain, in purfuit of the fugitives. One of Craffus's lieutenants, named *Vargunteius*, having feparated in the night from the main body of the army, with four cohorts, miffed his way, and was overtaken by the enemy; at whofe approach he withdrew to a neighbouring hill, where he defended himfelf, with great valour, till all his men were killed, except 20, who made their way through the enemy, fword in hand, and got fafe to Carrhæ: but Vargunteius himfelf loft his life on the occafion.

In the mean time Surenas, not knowing whether Craffus and Caffius had retired to Carrhæ, or chofen a different route; in order to be informed of the truth, and take his meafures accordingly, defpatched a meffenger, who fpoke the Roman language, to the city of Carrhæ, enjoining him to approach the walls, and acquaint Craffus himfelf, or Caffius, that the Parthian general was inclined to enter into a treaty with them, and demanded a conference. Both the proconful and his quæftor Caffius fpoke from the walls with the meffenger; and, accepting the propofal with great joy, defired that the time and place for an interview might be immediately agreed upon. The meffenger withdrew, promifing to return quickly with an anfwer from Surenas: but that general no fooner underftood that Craffus and Caffius were in Carrhæ, than he marched thither with his whole army; and, having invefted the place, acquainted the Romans, that if they expected any favourable terms, they muft deliver up Craffus and Caffius to him in chains. Hereupon a council of the chief officers being fummoned, it was thought expedient to retire from Carrhæ that very night, and feek for another afylum. It was of the utmoft importance that none of the inhabitants of Carrhæ fhould be acquainted with their defign till the time of its execution; but Craffus, whofe whole conduct evidently fhows that he was blinded, as Dio Caffius obferves, by fome divinity, imparted the whole matter in confidence to one Andromachus, choofing him for his guide, and relying injudicioufly on the fidelity of a man whom he fcarce knew. Andromachus immediately acquainted Surenas with the defign of the Romans; promifing at the fame time, as the Parthians did not engage in the night, to manage matters fo, that they fhould not get out of his reach before daybreak. Purfuant to his promife, he led them through many windings and turnings, till he brought them into deep marfhy grounds, where the infantry were up to the knees in mire. Then Caffius, fufpecting that their guide had led them into thofe bogs with no good defign, refufed to follow him any longer; and returning to Carrhæ, took his route towards Syria, which he reached with 500 horfe. Octavius, with 5000 men under his command, being conducted by trufty guides, gained

(Margin: 15 Surenas pretends to confer with Craffus.)

Parthia. gained the mountains called by Plutarch and Appian *Sinnaci*, and there intrenched himſelf before break of day.

As for Craſſus, he was ſtill entangled in the marſhes, when Surenas, at the riſing of the ſun, overtook him, and inveſted him with his cavalry. The proconſul had with him four cohorts, and a ſmall body of horſe; and with theſe he gained, in ſpite of all oppoſition, the ſummit of another hill within 12 furlongs of Octavius; who ſeeing the danger that threatened his general, flew to his aſſiſtance, firſt with a ſmall number of his men, but was ſoon followed by all the reſt, who, being aſhamed of their cowardice, quitted their poſt, though very ſafe, and charging the Parthians with great fury, diſengaged Craſſus, and obliged the enemy to abandon the hill. Upon the retreat of the enemy, they formed themſelves into a hollow ſquare; and placing Craſſus in the middle, made a kind of rampart round him with their bucklers, reſolutely proteſting, that none of the enemy's arrows ſhould touch their general's body, till they were all killed fighting in his defence. Surenas, loth to let ſo fine a prey eſcape, ſurrounded the hill, as if he deſigned to make a new attack: but, finding his Parthians very backward, and not doubting but the Romans, when night came on, would purſue their march, and get out of his reach, he had recourſe again to artifice; and declared before ſome priſoners, whom he ſoon after ſet at liberty, that he was inclined to treat with the proconſul of a peace; and that it was better to come to a reconciliation with Rome, than to ſow the ſeeds of an eternal war, by ſhedding the blood of one of her generals.

Agreeable to this declaration, Surenas, as ſoon as the priſoners were releaſed, advanced towards the hill where the Romans were poſted, attended only by ſome of his officers, and, with his bow unbent, and open arms, invited Craſſus to an interview. So ſudden a change ſeemed very ſuſpicious to the proconſul; who therefore declined the interview, till he was forced, by his own ſoldiers, to intruſt his life with an enemy whoſe treachery they had all experienced; for the legionaries flocking round him, not only abuſed him in an outrageous manner, but even menaced him if he did not accept of the propoſals made him by the Parthian general. Seeing, therefore, that his troops were ready to mutiny, he began to advance, without arms or guards, towards the enemy, after having called the gods and his officers to witneſs the violence his troops offered him; and intreated all who were preſent, but eſpecially Octavius and Petronius, two of the chief commanders, for the honour of Rome their common mother, not to mention, after his death, the ſhameful behaviour of the Roman legionaries. Octavius and Petronius could not reſolve to let him go alone; but attended him down the hill, as did likewiſe ſome legionaries, keeping at a diſtance. Craſſus was met at the foot of the hill by two Greeks who, diſmounting from their horſes, ſaluted him with great reſpect; and deſired him in the Greek tongue, to ſend ſome of his attendants, who might ſatisfy him that Surenas, and thoſe who were with him, came without arms. Hereupon Craſſus ſent two brothers, of the Roſcian family; but Surenas having cauſed them to be ſeized, advanced to the foot of the hill, mounted on a fine horſe, and attended by the chief officers of his army. Craſſus, who waited for the return of his two meſſengers, was ſurpriſed to ſee himſelf prevented by Surenas in perſon, when he leaſt expected it. The Parthian general, perceiving, as he approached Craſſus, that he was on foot, cried out, in a ſeeming ſurpriſe, "What do I ſee? a Roman general on foot, and we on horſeback! Let a horſe be brought for him immediately." "You need not be ſurpriſed (replied Craſſus): we are come only to an interview, each after the cuſtom of his country." "Very well (anſwered Surenas), there ſhall be henceforth a laſting peace between King Orodes and the people of Rome: but we muſt ſign the articles of it on the banks of the Euphrates; for you Romans do not always remember your conventions." Craſſus would have ſent for a horſe; but a very ſtately one with a golden bit, and richly capariſoned, was brought to him by a Parthian; which Surenas preſenting to him, "Accept this horſe from my hands (ſaid he), which I give you in the name of my maſter King Orodes." He had ſcarce uttered theſe words, when ſome of the king's officers, taking Craſſus by the middle, ſet him upon the horſe, which they began to whip with great violence before them in order to make him quicken his pace. Octavius, offended at this inſult, took the horſe by the bridle; Petronius and the few Romans who were preſent, ſeconded him, and flocking all round Craſſus, ſtopped his horſe. The Parthians endeavoured to repulſe them, and clear the way for the proconſul; whereupon they began to juſtle and puſh one another with great tumult and diſorder. At laſt, Octavius, drawing his ſword, killed one of the king's grooms; but, at the ſame time, another coming behind Octavius, with one blow laid him dead at his feet. Both parties fought with great reſolution, the Parthians ſtriving to carry off Craſſus, and the Romans to reſcue him out of their hands. In this ſcuffle moſt of the Romans who 16. came to the conference were killed; and amongſt the Craſſus reſt, Craſſus himſelf, but whether by a Roman or a Par- killed. thian is uncertain.

Upon his death, the reſt of the army either ſurrendered to the enemy, or, diſperſing in the night, were purſued, and put to the ſword. The Romans loſt in this campaign at leaſt 30,000 men; of which 20,000 were killed, and 10,000 taken priſoners.

When the battle of Carrhæ was fought, King Orodes was in Armenia, where he had made peace with Artabazus. While the two kings were ſolemnizing their new alliance with expenſive and public feaſts, Styllaces or Syllaces, a Parthian officer, whom Surenas had ſent with the news of his late victory, and the head of Craſſus as a proof of it, arrived in the capital of Armenia. The tranſports of joy which Orodes felt at this ſight, and theſe news, are not to be expreſſed; and the lords of both kingdoms, who attended their ſovereigns, raiſed loud and repeated ſhouts of joy. Syllaces was ordered to give a more particular and diſtinct account of that memorable action; which when he had done, Orodes commanded melted gold to be poured into Craſſus's mouth; reproaching him thereby with avarice, which had been always his predominant paſſion. 17

Surenas did not long enjoy the pleaſure of his victory; Surenas put for Orodes, jealous of his power and authority among to death by the Parthians, ſoon after cauſed him to be put to death. Orodes. Pacorus, the king's favourite ſon was put at the head of the army; and, agreeably to his father's directions, invaded Syria; but he was driven out from thence with great loſs by Cicero and Caſſius, the only general who ſurvived the defeat of Craſſus. After this we find no mention

Parthia.

mention of the Parthians, till the time of the civil war between Cæſar and Pompey, when the latter ſent ambaſſadors to ſolicit ſuccour againſt his rivals. This Orodes was willing to grant upon condition that Syria was delivered up to him; but as Pompey would not conſent to ſuch a propoſal, the ſuccours were not only denied, but, after the battle of Pharſalia, he put Lucius Hirtius in irons, whom Pompey had again ſent to aſk aſſiſtance, or at leaſt to deſire leave to ſhelter himſelf in the Parthian dominions.

Cæſar is ſaid to have meditated a war againſt the Parthians, which in all probability would have proved fatal

18 War commenced againſt the Parthians by Mark Antony.

to them. His death delivered them from this danger. But, not long after, the eaſtern provinces, being grievouſly oppreſſed by Mark Antony, roſe up in arms; and having killed the tax-gatherers, invited the Parthians to join them and drive out the Romans. They very readily accepted the invitation, and croſſed the Euphrates with a powerful army under the command of Pacorus, and Labienus a Roman general of Pompey's party. At firſt they met with great ſucceſs, overran all Aſia Minor, and reduced all the countries as far as the Helleſpont and the Egæan ſea, ſubduing likewiſe Phœnicia, Syria, and even Judea. They did not however long enjoy their new conqueſts: for being elated with their victories, and deſpiſing the enemy, they engaged Ventidius, Antony's lieutenant, before Labienus had time to join them, and were utterly defeated. This ſo diſheartened Labienus's army, that they all abandoned him; and he himſelf, being thus obliged to wander from place to place in diſguiſe, was at laſt taken and put to death at Cyprus. Ventidius purſuing his advantage, gained ſeveral other victories; and at laſt entirely defeated the Parthian army under Pacorus,

19 Pacorus defeated and killed by Ventidius.

cutting almoſt the whole of them in pieces, and the prince himſelf among the reſt. He did not, however, purſue this laſt victory as he might have done; being afraid of giving umbrage to Antony, who had already become jealous of the great honour gained by his lieutenant. He therefore contented himſelf with reducing thoſe places in Syria and Phœnicia which the Parthians had taken in the beginning of the war, until Antony arrived to take the command of the army upon himſelf.

Orodes was almoſt diſtracted with grief on receiving the dreadful news of the loſs of his army and the death of his favourite ſon. However, when time had reſtored the uſe of his faculties, he appointed Phrahates, the eldeſt but the moſt wicked, of all his children, to ſucceed him in the kingdom, admitting him at the ſame time to a ſhare of the ſovereign authority with himſelf.

20 Orodes murdered.

The conſequence of this was, that Phrahates very ſoon attempted to poiſon his father with hemlock. But this, contrary to expectation, proving a cure for the dropſy, which an exceſs of grief had brought upon the king, the unnatural ſon had him ſtifled in bed, and ſoon after not only murdered all his own brethren, who were thirty in number, but cut off all the reſt of the royal family, not ſparing even his own eldeſt ſon, leſt the diſcontented Parthians ſhould place him, as he was already of age, on the throne.

Many of the chief lords of Parthia being intimidated by the cruelty of Phrahates, retired into foreign countries: and among thoſe one Monæſes, a perſon of great diſtinction, as well as ſkill and experience in war. This man, having fled to Antony, ſoon gained his confidence, and was by him eaſily prevailed upon to engage in a war againſt his countrymen. But Phrahates juſtly dreading the conſequences of ſuch a perſon's defection, ſent a ſolemn embaſſy to invite him home on ſuch terms as he ſhould think fit to accept; which greatly provoked Antony; though he did not hinder him from returning, leſt others ſhould thereby be diſcouraged from coming over to him. He therefore diſmiſſed him with great civility, ſending ambaſſadors at the ſame time to Phrahates to treat of a peace. Thus he hoped to divert the Parthian monarch's attention from making the neceſſary preparations for war, and that he ſhould be able to fall upon him in the ſpring when he was in no condition to make reſiſtance. But herein he was greatly diſappointed; for on his arrival at the Euphrates, which he intended to paſs, and enter the Parthian dominions on that ſide, he found all the paſſes ſo well guarded, that he thought proper to enter Media with a deſign firſt to reduce that country, and then to enter Parthia.

21 Antony betrayed by Artabazus king of Armenia.

This plan had been ſuggeſted to him by Artabazus king of Armenia, who in the end betrayed him; for inſtead of conducting the army the ſtraight way from Zeugma on the Euphrates, to the Araxes which parted Media from Armenia, and which was about 500 miles diſtant from the place whence he firſt ſet out, Artabazus led them over the rocks and mountains ſo far about, that the army had marched above 1000 miles before they reached the borders of Media, where they intended to begin the war. Thus they were not only greatly fatigued but had not ſufficient time, the year being far ſpent, to put in execution the deſign on which they had come. However, as Antony was impatient to get back to Cleopatra, he left behind him moſt of the baggage of the army, and 300 waggons loaded with battering rams and other military engines for ſieges; appointing Statianus, one of his lieutenants, with a body of 10,000 men, to guard them, and to bring them, by ſlow marches, after the army. With the reſt of the forces he marched more than 300 miles before the reſt, without allowing his men any reſpite till he arrived at Praaſpa or Phrahata, the capital of Media, which he immediately inveſted. But the Parthians, well knowing that he could not make any progreſs without his military machines, paſſed by his army, in order to attack Statianus; which they did with ſuch ſucceſs, that the body commanded by him were all to a man cut off, and all their military engines taken, among which was a battering ram 80 feet long.

22 Ten thouſand Romans cut off.

Antony, notwithſtanding this diſaſter, continued the ſiege of Praaſpa; but was daily haraſſed by ſallies of the garriſon from within, and the enemy's army without. At laſt he began to think of a retreat when his proviſions were almoſt exhauſted, finding it impoſſible to become maſter of the city. But as he was to march 300 miles through the enemy's country, he thought proper firſt to ſend ambaſſadors to the Parthian monarch, acquainting him that the Roman people were willing to allow him a peace, provided he would reſtore the ſtandards and priſoners taken at Carrhæ. Phrahates received the ambaſſadors, ſitting on a golden throne; and, after having bitterly inveighed againſt the avarice and unbounded ambition of the Romans, told them that he would not part with the ſtandards and priſoners; but that if Antony would immediately raiſe the ſiege of Praaſpa, he would ſuffer him to retire unmoleſted.

Antony, who was reduced to great ſtraits, no ſooner

received this answer than he broke up the siege, and marched towards Armenia. However, Phrahates was not so good as his word; for the Romans were attacked by the enemy no fewer than 18 times on their march, and were thrice in the utmost danger of being cut off. A famine also raged in the Roman army; upon which they began to desert to the enemy; and indeed Antony would probably have been left by himself, had not the Parthians, in a very cruel as well as impolitic manner, murdered all those who fled to them in sight of the rest. At last, after having lost 32,000 men, and being reduced to such despair that he was with difficulty prevented from laying violent hands on himself, he reached the river Araxes; when his men, finding themselves out of the reach of the enemy, fell down on the ground, and kissed it with tears of joy.

23 Antony leaves Parthia in great distress.

Antony was no sooner gone, than the kings of Media and Parthia quarrelled about the booty they had taken; and after various contests Phrahates reduced all Media and Armenia. After this, being elated with his conquests, he oppressed his subjects in such a cruel and tyrannical manner, that a civil war took place; in which the competitors were alternately driven out and restored, till the year 50, when one Vologeses, the son of Gortarzes, a former king, became peaceable possessor of the throne. He carried on some wars against the Romans, but with very indifferent success, and at last gladly consented to a renewal of the ancient treaties with that powerful people.

24 Parthia subdued by Trajan.

From this time the Parthian history affords nothing remarkable till the reign of the emperor Trajan; when the Parthian king, by name *Cosdroes*, infringed the treaty with Rome, by driving out the king of Armenia. Upon this Trajan, who was glad of any pretence to quarrel with the Parthians, immediately hastened into Armenia. His arrival there was so sudden and unexpected, that he reduced almost the whole country without opposition; and took prisoner Parthamasiris, the king whom the Parthians had set up. After this he entered Mesopotamia, took the city of Nisibis, and reduced to a Roman province the whole of that wealthy country.

Early in the spring of the following year, Trajan, who had kept his winter quarters in Syria, took the field again; but was warmly opposed by Cosdroes.—He found him encamped on the banks of the Euphrates, with a design to dispute his passage; which he did with such vigour, that the emperor, after having several times attempted to ford that river, and been always repulsed with great slaughter, was obliged to cause boats to be built on the neighbouring mountains, which he privately conveyed from thence on carriages to the water side; and having in the night time formed a bridge with them, he passed his army the next day; but not without great loss and danger, the Parthians harassing his men the whole time with incessant showers of arrows, which did great execution. Having gained the opposite bank, he advanced boldly into Assyria, the Parthians flying everywhere before him, and made himself master of Arbela. Thence he pursued his march; subduing, with incredible rapidity, countries where the Roman standard had never been before displayed. Babylonia, or the province of Babylon, voluntarily submitted to him. The city itself was, after a vigorous resistance, taken by storm; by which means he became master of all Chaldea and Assyria, the two richest provinces of the Parthian empire. From Babylon he marched to Ctesiphon, the metropolis of the Parthian monarchy; which he besieged, and at last reduced. But as to the particulars of these great conquests, we are quite in the dark; this expedition, however glorious to the Roman name, being rather hinted at than described, by the writers of those times. While Trajan was thus making war in the heart of the enemy's country, Cosdroes, having recruited his army, marched into Mesopotamia, with a design to recover that country, and cut off all communication between the Roman army and Syria. On his arrival in that province, the inhabitants flocked to him from all parts; and most of the cities, driving out the garrisons left by Trajan, opened their gates to him. Hereupon the emperor detached Lucius and Maximus, two of his chief commanders, into Mesopotamia, to keep such cities in awe as had not revolted, and to open a communication with Syria. Maximus was met by Cosdroes; and having ventured a battle, his army was entirely defeated, and himself killed. But Lucius being joined by Euricius and Clarius, two other commanders sent by Trajan with fresh supplies, gained considerable advantages over the enemy, and retook the cities of Nisibis and Seleucia, which had revolted.

And now Trajan, seeing himself possessed of all the best and most fruitful provinces of the Parthian empire, but at the same time being well apprised that he could not, without a vast expence, maintain his conquests, nor keep in subjection so fierce and warlike a people at such a distance from Italy; resolved to set over them a king of his own choosing, who should hold the crown of him and his successors, and acknowledge them as his lords and sovereigns. With this view he repaired to Ctesiphon; and having there assembled the chief men of the nation, he crowned one of the royal family, by name *Parthanaspates*, king of Parthia, obliging all who were present to pay him their allegiance. He chose Parthanaspates, because that prince had joined him at his first entering the Parthian dominions, conducted him with great fidelity, and shown on all occasions an extraordinary attachment to the Romans. Thus the Parthians were at last subdued, and their kingdom made tributary to Rome. But they did not long continue in this state of subjection: for they no sooner heard of Trajan's death, which happened shortly after, than, taking up arms, they drove Parthanaspates from the throne; and recalling Cosdroes, who had retired into the country of the Hyrcanians, openly revolted from Rome. Adrian, who was then commander in chief of all the forces in the east, and soon after acknowledged emperor by the army, did not wish, though he was at that time in Syria with a very numerous army, to engage in a new war with the Parthians; but contented himself with preserving the ancient limits of the empire, without any ambitious prospects of further conquests. Therefore, in the beginning of his reign, he abandoned those provinces beyond the Euphrates which Trajan had conquered; withdrew the Roman garrisons from Mesopotamia; and, for the greater safety of other places, made the Euphrates the boundary of, and barrier in, those parts, posting his legions along the banks of that river.

25 Parthanaspates appointed king by the Roman emperor, but soon after driven out.

Cosdroes died after a long reign, and was succeeded by his eldest son Vologeses: in whose reign the Alani breaking into Media, then subject to the Parthians, committed

26 Unsuccessful wars of Vologeses with the Romans.

Parthia. committed there great devaſtations; but were prevailed upon, with rich preſents ſent them by Vologeſes, to abandon that kingdom, and return home. Upon their retreat, Vologeſes, having no enemy to contend with at home, fell unexpectedly upon Armenia; ſurpriſed the legions there; and having cut them all in pieces to a man, entered Syria; defeated with great ſlaughter Attilius Cornelianus, governor of that province; and advanced without oppoſition to the neighbourhood of Antioch; putting everywhere the Romans, and thoſe who favoured them, to the ſword. Hereupon the emperor Verus, by the advice of his colleague Antoninus ſurnamed the *Philoſopher*, leaving Rome, haſtened into Syria; and having driven the Parthians out of that province, ordered Statius Priſcus to invade Armenia, and Caſſius with Martius Verus to enter the Parthian territories, and carry the war into the enemy's country. Priſcus made himſelf maſter of Artaxata; and in one campaign drove the Parthians, though not without great loſs on his ſide, quite out of Armenia. Caſſius, on the other hand, having in ſeveral encounters defeated Vologeſes, though he had an army of 400,000 men under his command, reduced, in four years time, all thoſe provinces which had formerly ſubmitted to Trajan, took Seleucia, burnt and plundered the famous cities of Babylon and Cteſiphon, with the ſtately palaces of the Parthian monarchs, and ſtruck terror into the moſt remote provinces of that great empire. On his return, he loſt above half the number of his forces by ſickneſs and famine; ſo that, after all, the Romans, as Spartianus obſerves, had no great reaſon to boaſt of their victories and conqueſts.

However, Verus, who had never ſtirred during the whole time of the war from Antioch and Daphne, took upon him the lofty titles of *Parthicus* and *Armenicus*, as if he had acquired them juſtly in the midſt of his pleaſures and debaucheries. After the revolt and death of Caſſius, Antoninus the Philoſopher repaired into Syria to ſettle the affairs of that province. On his arrival there, he was met by ambaſſadors from Vologeſes; who having recovered moſt of the provinces ſubdued by Caſſius, and being unwilling either to part with them or engage in a new war, ſolicited the emperor to confirm him in the poſſeſſion of them, promiſing to hold them of him, and to acknowledge the ſovereignty of Rome. To theſe terms Antoninus readily agreed, and a peace was accordingly concluded between the two empires; which Vologeſes did not long enjoy, being ſoon after carried off by a diſtemper, and not murdered by his own ſubjects, as we read in Conſtantinus Manaſſes, who calls him *Belegeſes*.

27 Cteſiphon taken by Severus.

Upon his death, Vologeſes III. the ſon of his brother Sanatruces, and grandſon of Coſdroes, was raiſed to the throne. He ſided with Niger againſt the emperor Severus: who thereupon having ſettled matters at home, marched with all his forces againſt him; and advancing to the city of Cteſiphon, whither he had retired, laid cloſe ſiege to that metropolis. Vologeſes made a moſt gallant defence: but the city, after a long ſiege, and much bloodſhed on both ſides, was at length taken by aſſault. The king's treaſures, with his wives and children, fell into the emperor's hands: but Vologeſes himſelf had the good luck to make his eſcape; which was a great diſappointment to Severus, who immediately deſpatched an expreſs to acquaint the ſenate with the ſucceſs that had attended him in his expedition againſt the only nation that was then formidable to Parthia. Rome. But he had no ſooner croſſed the Euphrates than Vologeſes recovered all the provinces except Meſopotamia, which he had reduced. Theſe expeditions were chargeable to the Romans, and coſt them much blood, without reaping any advantages from them; for as they had not ſufficient forces to keep in awe the provinces they had ſubdued, the inhabitants, greatly attached to the family of Arſaces, never failed to return to their ancient obedience as ſoon as the Roman armies were withdrawn. Vologeſes was ſoon after engaged in a war ſtill more troubleſome and deſtructive, with his brother Artabanus, who, encouraged by ſome of the diſcontented nobles, attempted to rob him of the crown, and place it on his own head. Vologeſes gained ſeveral victories over his brother and rebellious ſubjects; but died before he could reſtore the empire to its former tranquillity.

Artabanus, who had a numerous army at his devotion, did not meet with any oppoſition in ſeizing the throne, vacant by the death of his brother, though Tiridates had a better title to it, as being his elder brother. He had ſcarce ſettled the affairs of his kingdom, when the emperor Caracalla, deſirous to ſignalize himſelf as ſome of his predeceſſors had done, by ſome memorable exploit againſt the Parthians, ſent a ſolemn embaſſy to him, deſiring his daughter in marriage. Artabanus, overjoyed at this propoſal, which he thought would be attended with a laſting peace between the two empires, received the ambaſſadors with all poſſible marks of honour, and readily 28

Infamous treachery of the emperor Caracalla.

complied with their requeſt. Soon after, Caracalla ſent a ſecond embaſſy to acquaint the king that he was coming to ſolemnize the nuptials; whereupon Artabanus went to meet him attended with the chief of the nobility and his beſt troops, all unarmed, and in moſt pompous habits: but this peaceable train no ſooner approached the Roman army, than the ſoldiers, on a ſignal given them, falling upon the king's retinue, made a moſt terrible ſlaughter of the unarmed multitude, Artabanus himſelf eſcaping with great difficulty. The treacherous Caracalla, having gained by this exploit great booty, and, as he thought, no leſs glory, wrote a long and boaſting letter to the ſenate, aſſuming the title of *Parthicus* for this piece of treachery; as he had before that of *Germanicus*, for murdering, in like manner, ſome of the German nobility.

Artabanus, reſolving to make the Romans pay dear for their inhuman and barbarous treachery, raiſed the moſt numerous army that had ever been known in Parthia, croſſed the Euphrates, and entered Syria, putting all to fire and ſword. But Caracalla being murdered before this invaſion, Macrinus, who had ſucceeded him, met the Parthians at the head of a mighty army, compoſed of many legions, and all the auxiliaries of the ſtates of Aſia. The two armies no ſooner 29

A deſperate battle between the Parthians and Romans.

came in ſight of each other, but they engaged with the utmoſt fury. The battle continued two days; both Romans and Parthians fighting ſo obſtinately, that night only parted them, without any apparent advantage on either ſide; though both retired when night had put an end to the conteſt, crying, Victory, victory. The field of battle was covered all over with dead bodies, there being already above 40,000 killed, including both Romans and Parthians: nevertheleſs

Artabanus was heard to ſay, that the battle was only begun, and that he would continue it till either the Parthians or Romans were all to a man cut in pieces. But Macrinus, being well appriſed that the king came highly enraged againſt Caracalla in particular, and dreading the conſequences which would attend the deſtruction of his army, ſent a herald to Artabanus, acquainting him with the death of Caracalla, and propoſing an alliance between the two empires. The king, underſtanding that his great enemy was dead, readily embraced the propoſals of peace and amity, upon condition that all the priſoners who had been taken by the treachery of Caracalla ſhould be immediately reſtored, and a large ſum of money paid him to defray the expences of the war.

Theſe articles being performed without delay or heſitation, Artabanus returned into Parthia, and Macrinus to Antioch.

80 The Perſians revolt and overthrow the Parthian empire.

As Artabanus loſt on this occaſion the flower of his army, Artaxerxes, a Perſian of mean deſcent, but of great courage and experience in war, revolting from the Parthians, prevailed on his countrymen to join him, and attempt the recovery of the ſovereign power, which he ſaid they had been unjuſtly deprived of, firſt by the Macedonians, and afterwards by the Parthians, their vaſſals. Artabanus, upon the news of this revolt, marched with the whole ſtrength of his kingdom to ſuppreſs it; but being met by Artaxerxes at the head of a no leſs powerful army, a bloody battle enſued, which is ſaid to have laſted three days. At length the Parthians, though they behaved with the utmoſt bravery, and fought like men in deſpair, were forced to yield to the Perſians, who were commanded by a more experienced leader. Moſt of their troops were cut off in the flight; and the king himſelf was taken priſoner, and ſoon after put to death at Artaxerxes's order. The Parthians having loſt in this fatal engagement both their king and their army, were forced to ſubmit to the conqueror, and become vaſſals to a nation which had been ſubject to them for the ſpace of 475 years.

For an account of the manners, cuſtoms, &c. of the ancient Parthians, ſee the article PERSIA.

PARTI, PARTIE, *Party*, or *Parted*, in *Heraldry*, is applied to a ſhield or eſcutcheon, denoting it divided or marked out into partitions.

PARTI per pale, is when the ſhield is divided perpendicularly into two halves, by a cut in the middle from top to bottom.

PARTI per feſs, is when the cut is acroſs the middle from ſide to ſide.

PARTI per bend dexter, is when the cut comes from the upper corner of the ſhield on the right hand, and deſcends athwart to the oppoſite lower corner.

PARTI per bend ſiniſter, is when the cut, coming from the upper left corner, deſcends acroſs to the oppoſite lower one.

All theſe partitions, according to M. de la Colombiere, have their origin in the cuts and bruiſes that have appeared on ſhields after engagements; and being proofs of the dangers to which the bearers had been expoſed, they gained them eſteem; for which reaſon they were tranſmitted to poſterity, and became arms and marks of honour to their future families.

PARTIALITY. See *SELF-partiality* and PREJUDICE.

PARTICIPLE, in *Grammar*, an adjective formed of a verb; ſo called becauſe it participates partly of the properties of a noun, and partly of thoſe of a verb. See GRAMMAR.

PARTICLE, in *Phyſics*, the minute part of a body, an aſſemblage of which conſtitutes all natural bodies.

In the new philoſophy, particle is often uſed in the ſame ſenſe with atom in the ancient Epicurean philoſophy, and corpuſcle in the latter. Some writers, however, diſtinguiſh them; making particle an aſſemblage or compoſition of two or more primitive and phyſically indiviſible corpuſcles or atoms; and corpuſcle, or little body, an aſſemblage or maſs of ſeveral particles or ſecondary corpuſcles. The diſtinction, however, is of little moment; and, as to moſt purpoſes of phyſics, particle may be underſtood as ſynonymous with corpuſcle. Particles are then the elements of bodies: it is the various arrangement and texture of theſe, with the difference of the coheſion, &c. that conſtitute the various kinds of bodies, hard, ſoft, liquid, dry, heavy, light, &c. The ſmalleſt particles or corpuſcles cohere, with the ſtrongeſt attractions, and always compoſe larger particles of weaker coheſion; and many of theſe cohering compoſe larger particles, whoſe vigour is ſtill weaker; and ſo on for divers ſucceſſions, till the progreſſion end in the largeſt particles, on which the operations in chemiſtry, and the colours of natural bodies, depend, and which, by cohering, compoſe bodies of ſenſible bulks.

The coheſion of the particles of matter, according to the Epicureans, was effected by hooked atoms; the Ariſtotelians thought it managed by reſt, that is, by nothing at all. But Sir Iſaac Newton ſhows it is by means of a certain power whereby the particles mutually attract or tend toward each other, which is ſtill perhaps giving a fact without a cauſe. By this attraction of the particles he ſhows that moſt of the phenomena of the leſſer bodies are effected, as thoſe of the heavenly bodies are by the attraction of gravity. See ATTRACTION and COHESION.

PARTICLE, a term in *Theology*, uſed in the Latin church for the crumbs or little pieces of conſecrated bread, called in the Greek church μεριδες. The Greeks have a particular ceremony, called των μεριδων, *of the particles*, wherein certain crumbs of bread, not conſecrated, are offered up in honour of the Virgin, St John Baptiſt, and ſeveral other ſaints. They alſo give them the name of προσφορα, *oblatio*. Gabriel archbiſhop of Philadelphia wrote a little treatiſe expreſs περι των μεριδων, wherein he endeavours to ſhow the antiquity of this ceremony, in that it is mentioned in the liturgies of St Chryſoſtom and Baſil. There has been much controverſy on this head between the reformed and catholic divines. Aubertin and Blondel explain a paſſage in the theory of Germanus patriarch of Conſtantinople, where he mentions the ceremony of the particles as in uſe in his time, in favour of the former; Meſſieurs de Port Royal conteſt the explanation; but M. Simon, in his notes on Gabriel of Philadelphia, endeavours to ſhow that the paſſage itſelf is an interpolation, not being found in the ancient copies of Germanus,

Particle ‖ Partnership.

manus, and consequently that the dispute is very ill grounded.

Organic PARTICLES, are those small moving bodies which are imperceptible without the help of glasses; for besides those animals which are perceptible to the sight, some naturalists reckon this exceedingly small species as a separate class, if not of animals properly so called, at least of moving bodies, which are found in the semen of animals, and which cannot be seen without the help of the microscope. In consequence of these observations, different systems of generation have been proposed concerning the spermatic worms of the male and the eggs of the female. In the second volume of Buffon's Natural History, several experiments are related, tending to show that those moving bodies which we discover by the help of glasses in the male semen are not real animals, but organic, lively, active, and indestructible molecules, which possess the property of becoming a new organized body similar to that from which they were extracted. Buffon found such bodies in the female as well as in the male semen; and he supposes that the moving bodies which he observed with the microscope in infusions of the germs of plants are likewise vegetable organic molecules. Needham, Wrisberg, Spalanzani, and several other writers on the animal economy, have pursued the same track with M. de Buffon.

Some suppose that these organic molecules in the semen answer no purpose but to excite the venereal desire: but such an opinion cannot be well founded; for eunuchs, who have no seminal liquor, are nevertheless subject to venereal desire. With respect to the beautiful experiments which have been made with the microscope on organic molecules, M. Bonnet, that learned and excellent observer of nature, remarks that they seem to carry us to the farthest verge of the sensible creation, did not reason teach us that the smallest visible globule of seminal liquor is the commencement of another universe, which, from its infinite smallness, is beyond the reach of our best microscopes.—*Animalcules*, properly so called, must not be confounded with the wonderful organic particles of Buffon. See ANIMALCULE.

PARTICLE, in *Grammar*, a denomination for all those small words that tie or unite others, or that express the modes or manners of words. See GRAMMAR.

PARTING, in *Chemistry* and *Metallurgy*, an operation by which gold and silver are separated from each other. See CHEMISTRY, and *ORES*, *Reduction of*.

PARTISAN, in the art of war, a person dexterous in commanding a party; who, knowing the country well, is employed in getting intelligence, or surprising the enemy's convoys, &c. The word also means an officer sent out upon a party, with the command of a body of light troops, generally under the appellation of the partisan's corps. It is also necessary that this corps should be composed of infantry, light horse, and hussars.

PARTNERSHIP, is a contract among two or more persons, to carry on a certain business, at their joint expence, and share the gain or loss which arises from it. Of this there are four kinds.

I. Occasional joint trade, where two or more merchants agree to employ a certain sum in trade, and divide the gain or loss so soon as the adventure is brought to an issue. This kind of contract being generally private, the parties concerned are not liable for each other. If one of them purchase goods on trust, the furnisher, who grants the credit through confidence in him alone, has no recourse, in case of his insolvency, against the other partners. They are only answerable for the share of the adventure that belongs to the insolvent partner.

Partnership.

If it be proposed to carry the adventure farther than originally agreed on, any partner may withdraw his interest; and if it cannot be separated from the others, may insist that the whole shall be brought to an issue.

II. Standing companies, which are generally established by written contract between the parties, where the stock, the firm, duration, the division of the gain or loss, and other circumstances, are inserted.

All the partners are generally authorized to sign by the firm of the company, though this privilege may be confined to some of them by particular agreement. The firm ought only to be subscribed at the place where the copartnery is established. If a partner has occasion, when absent, to write a letter relating to their affairs, he subscribes his own name on account of the company. When the same partners carry on business at different places, they generally choose different firms for each. The signature of each partner is generally sent to new correspondents; and when a partner is admitted, although there be no alteration in the firm, his signature is transmitted, with an intimation of the change in the copartnery to all their correspondents. Houses that have been long established, often retain the old firm, though all the original partners be dead or withdrawn.

The powers of each partner are, in general, discretionary; but they ought not to act, in matters of importance, without consulting together, when there is an opportunity. No partner is liable to make good the loss arising from his judging wrong in a case where he had authority to act. If he exceeds his power, and the event prove unsuccessful, he must bear the loss; but if it prove successful, the gain belongs to the company: yet if he acquaints the company immediately of what he has done, they must either acquiesce therein, or leave him the chance of gain, as well as the risk of loss.

All debts contracted under the firm of the company are binding on the whole partners, though the money was borrowed by one of them for his private use, without the consent of the rest. And if a partner exceeds his power, the others are nevertheless obliged to implement his engagements; though they may render him responsible for his misbehaviour.

Although the sums to be advanced by the partners be limited by the contract, if there be a necessity for raising more money to answer emergencies or pay the debts of the company, the partners must furnish what is necessary, in proportion to their shares.

A debt to a company is not cancelled by the private debts of the partner: and when a partner becomes insolvent, the company is not bound for his debts beyond the extent of his share.

The debts of the company are preferable, on the company's effects, to the private debts of the partners.

Partnership is generally dissolved by the death of a partner;

Partner-ship.

partner; yet, when there are more partners than two, it may, by agreement, fubfift among the furvivors. Sometimes it is ftipulated, that, in cafe of the death of a partner, his place fhall be fupplied by his fon, or fome other perfon condefcended on. The contract ought to fpecify the time and manner in which the furviving partners fhall reckon with the executors of the deceafed for his fhare of the ftock, and a reafonable time allowed for that purpofe.

When partnerfhip is diffolved, there are often outftanding debts that cannot be recovered for a long time, and effects that cannot eafily be difpofed of. The partnerfhip, though diffolved in other refpects, ftill fubfifts for the management of their outftanding affairs: and the money arifing from them is divided among the partners, or their reprefentatives, when it is recovered. But as this may protract the final fettlement of the company's affairs to a very inconvenient length, other methods are fometimes ufed to bring them to a conclufion, either in confequence of the original contract, or by agreement at the time of diffolution. Sometimes the debts and effects are fold by auction; fometimes they are divided among the partners; and when there are two partners, one divides them into fhares, as equal as poffible, and the other choofes either fhare he thinks beft.

If a partner withdraws, he continues refponfible for his former partners till it be publicly known that he hath done fo. A deed of feparation, regiftered at a public office, is fufficient prefumption of fuch notoriety.

III. Companies, where the bufinefs is conducted by officers. There are many companies of this kind in Britain, chiefly eftablifhed for purpofes which require a larger capital than private merchants can command. The laws with refpect to thefe companies, when not confirmed by public authority, are the fame as the former, but the articles of their agreement ufually very different. The capital is condefcended on; and divided into a certain number of fhares, whereof each partner may hold one or more, but is generally reftricted to a certain number. Any partner may transfer his fhare; and the company muft admit his affignee as a partner. The death of the partners has no effect on the company. No partner can act perfonally in the affairs of the company; but the execution of their bufinefs is intrufted to officers, for whom they are refponfible; and, when the partners are numerous, the fuperintendency of the officers is committed to directors chofen annually, or at other appointed times, by the partners.

IV. Companies incorporated by authority. A royal charter is neceffary to enable a company to hold lands, to have a common feal, and enjoy the other privileges of a corporation. A charter is fometimes procured, in order to limit the rifk of the partners: for, in every private company, the partners are liable for the debts, without limitation; in corporated focieties, they are only liable for their fhares in the ftock of the fociety. The incorporation of focieties is fometimes authorized by act of parliament: but this high authority is not neceffary, unlefs for conferring exclufive privileges.

Moral and Political Philofophy. Mr Paley fays, "I know of nothing upon the fubject of partnerfhip that requires explanation, but how the profits are to be divided where one partner contributes money and the other labour, which is a common cafe.

Partner-fhip, Partridge.

"*Rule.* From the ftock of the partnerfhip deduct the fum advanced, and divide the remainder between the moneyed partner and the labouring partner, in the proportion of the intereft of the money to the wages of the labour, allowing fuch a rate of intereft as money might be borrowed for upon the fame fecurity, and fuch wages as a journeyman would require for the fame labour and truft.

"*Example.* A advances 1000l. but knows nothing of the bufinefs; B produces no money, but has been brought up to the bufinefs, and undertakes to conduct it. At the end of the year the ftock and effects of the partnerfhip amount to 1200l. confequently there are 200l. to be divided. Now nobody would lend money, upon the event of the bufinefs fucceeding, which is A's fecurity, under 6 per cent. therefore A muft be allowed 60l. for the intereft of his money. B, before he engaged in the partnerfhip, earned 30l. a-year in the fame employment: his labour, therefore, ought to be valued at 30l. and the 200l. muft be divided between the partners in the proportion of 60 to 30; that is, A muft receive 133l. 6s. 8d. and B 66l. 13s. 4d. If there be nothing gained, A lofes his intereft, and B his labour, which is right. If the original ftock be diminifhed, by this rule B lofes only his labour as before; whereas A lofes his intereft and part of the principal; for which eventual difadvantage A is compenfated, by having the intereft of his money computed at 6 per cent. in the divifion of the profits when there is any. It is true, that the divifion of the profit is feldom forgotten in the conftitution of the partnerfhip; and is therefore commonly fettled by exprefs agreement; but thefe agreements, to be equitable, fhould purfue the principle of the rule here laid down. All the partners are bound by what any one of them does in the courfe of the bufinefs; for *quoad hoc*, each partner is confidered as an authorized agent for the reft."

PARTRIDGE, a fpecies of bird. See TETRAO, ORNITHOLOGY *Index*.

The partridge is fo valuable at the table, that a great many ways of taking it have been invented by fportfmen, all of which fucceed from the natural folly and timidity of the animal.

The places partridges delight in moft are corn fields, efpecially whilft the corn grows, for under that cover they fhelter and breed: neither are thofe places unfrequented by them when the corn is cut down, by reafon of the grain they find there, efpecially in wheat ftubble, the height of which they delight in, being to them as a covert or fhelter. When the wheat ftubble is much trodden by men or beafts, they then betake themfelves to the barley ftubble, provided it be frefh and untrodden; and they will, in the furrows, amongft the clots, branches, and long grafs, hide both themfelves and coveys, which are fometimes 20 in number, nay 30, in a covey.

When the winter feafon is arrived, and the ftubble fields are ploughed up, or over-foiled with cattle, partridges refort into the upland meadows, and lodge in the dead grafs, or fog, under hedges, amongft mole hiles, or under the roots of trees; fometimes they refort

to

Partridge. to coppices and underwoods, eſpecially if any corn fields are adjacent, or where there is grown broom, brakes, fern, &c.

In the harveſt time, when every field is full of men and cattle, in the day time they are found in the fallow fields which are next adjoining to the corn fields, where they lie lurking till evening or morning, and then they feed among the ſheaves of corn.

When their haunts are known, according to the ſituation of the country and ſeaſon of the year, the next care muſt be to find them out in their haunts, which is done ſeveral ways. Some do it by the eye only; and this art can never be taught, but learned by frequent experience, the colour of the birds being ſo like that of the earth at a diſtance, that no eye but a very converſant one could diſtinguiſh them. When they are once ſeen, the buſineſs is to keep the eye upon them, and then to keep in continual motion. They are a very lazy bird, and by this means will let a perſon almoſt tread upon them; though if the perſon ſtands ſtill to eye them, they will riſe immediately though they be at a conſiderable diſtance.

Another method of diſcovering them is, by going to their haunts very early in the morning, or at the cloſe of the evening, which is called the *jucking* time. The noiſe of the cock partridge is to be attended to at this time, and is very loud and earneſt. The hen will ſoon come up to the cock after her making the noiſe, which ſhe does by way of anſwer; and when they are got together, their chattering will diſcover them. Thus they may always be found at theſe times. But there is yet a better method of finding this bird, which is by the *call*. The buſineſs, in order to have ſucceſs in this way, is carefully to learn the notes of the partridge, and be able to imitate all the ſeveral ſounds. When perfect in this, the perſon is to go to the haunts morning and evening, and placing himſelf in ſome place where he can ſee the birds without being ſeen by them, he is to liſten to their calling; and when they are heard, he is to anſwer in the ſame notes, doubling again as they do: by continuing this, they may be brought ſo near, that the perſon lying down on his back may count their whole number. Having in this manner found where the birds are, the next care is to catch them.

They are ſo fooliſh, that it is extremely eaſy to take them in *nets*. In order to this, there needs no more that the going out, provided with two or three nets, with meſhes ſomewhat ſmaller than thoſe of the pheaſant nets, and walking round about the covey, a net is to be fixed ſo as to draw over them, on pulling a line at a diſtance. All this may be eaſily done; for ſo long as the ſportſman continues moving about, and does not fix his eye too intenſely upon them, they will let him come near enough to fix the net without moving. If they lie ſo ſtraggling, that one net will not cover them, then two or three muſt be fixed in the ſame manner. The ſportſman may then draw the nets over them, and they will often lie ſtill with the nets upon them till he comes up to fright them; then they will riſe, and be entangled in the net.

A ſecond method of taking them is with *bird lime*: this is done by means of wheat ſtraws. Theſe muſt be large, and cut off between knot and knot; they muſt be well limed with the beſt and ſtrongeſt bird lime, and the ſportſman muſt carry a great number out with him. Having found a field where there are partridges, he is to call; and if they anſwer, he is then to ſtick up the limed ſtraws in rows acroſs two or three lands, and going backward, call again to them, leading them on in the road where the ſtraws are: they will follow one another like a flock of chickens, and come out to the call; and will in their way run upon the ſtraws, and liming themſelves they will daub one another by crowding together, ſo that very few of them will be able to eſcape. Partridge.

But there is yet a pleaſanter way of taking them than this, that is, by *driving* of them. In order to this, an engine is to be made of canvaſs ſtuffed with ſtraw, to repreſent a horſe; this horſe and nets are to be taken to the haunts of the partridges, and the nets being placed ſlanting or ſlopwiſe in the lower part of the field, the ſportſman is to take the wind in his back and get above them, driving them downwards; his face is to be covered with ſomething green or blue, and placing the horſe before him, he is to go towards them ſlowly and gently; and by this means they will be raiſed on their legs, but not on their wings, and will run before the horſe into the nets. If in the way they go into a wrong path, the horſe is to be moved to face them; and they will be thus driven back again, and driven every way the ſportſman pleaſes.

The partridges of Abyſſinia, we are told, are very large, being as big as *capons*.

In Jeremiah xvii. 11. we have the following curious paſſage: "As the partridge ſitteth on *eggs*, and hatcheth *them* not; ſo he that getteth riches, and not by right, ſhall leave them in the midſt of his days, and at his end ſhall be a fool;" which is explained by Mr Poole as follows: It is no wonder if we cannot be certain as to the ſenſe of theſe words, ſo far as they concern natural hiſtory, when we are not certain what bird it is to which this doth relate. We tranſlate it *partridge*: others will have it to be a *cuckoo*; but certain it is, that it is the ſame word which we tranſlate *partridge*, (1 Sam. xxvi. 20.); and cuckoos uſe not to be much hunted after. How the partridge is ſaid to ſit on eggs and hatch them not, is yet a greater queſtion. It may be occaſioned ſo many ways, viz. either ſitting upon wind eggs; or being killed before the eggs are hatched; or having its eggs deſtroyed by the male partridge, or by ſome dog or other vermine; or, its neſt being found, having her eggs taken from her, that it is hard to determine which the prophet means. Of all others, I leaſt approve of that which Jerome makes the ſenſe, though the thing be true (if we may believe Caſſiodorus and ſeveral natural hiſtorians, Aldrovandus, &c.), that partridges have ſuch a love and deſire to hatch young ones, that having loſt their own eggs, they will ſteal the eggs of other partridges, and hatch them; which being hatched, the young ones knowing the cry of their proper dams, hearing them call, leave the partridge that hatched them (which is one thing quoted by Aldrovandus, to ſhow the ſagacity of that bird); but if this were the ſenſe, the words would be, 'as the partridge ſitteth on eggs, and hatcheth them, but enjoyeth them not;' whereas they are, 'hatcheth them not:' that is, having loſt them, either by ſome man that hath taken them from her, or by ſome vermin or wild beaſt." *Poole's Annot. in Loc.*

Partridge ‖ Paſcal.

The words in the original are, דגר ולא ילד קרא, which the Septuagint tranſlate ἐφώνησε πέρδιξ, &c. "The partridge cried; it gathered together what it had not produced;" and ſome tranſlate the Hebrew, "The partridge lays many eggs, but does not hatch them all." Le Clerc, upon the authority of Bocchart, underſtands the Hebrew word *kore* here to ſignify a *woodcock*. Le Clerc's tranſlation is as follows: *Ruſticula ova colligit, ſed non parit; facit ſibi divitias, ſed ſine jure, mediis ſuis diebus eas relinquit, atque ad extremum ſtulta eſt.*

PARTURITION, the act of bringing forth or being delivered of young. See MIDWIFERY.

PARTY, in a military ſenſe, a ſmall number of men, horſe or foot, ſent upon any kind of duty; as into an enemy's country to pillage, to take priſoners, and to oblige the country to come under contribution. Parties are often ſent out to view the roads and ways, get intelligence, ſeek forage; to reconnoitre, or amuſe the enemy upon a march: they are alſo frequently ſent upon the flanks of an army or regiment, to diſcover the enemy if near, and prevent ſurpriſe or ambuſcade.

PARVICH, an iſland near Dalmatia, and one of the beſt peopled and moſt conſiderable of thoſe which are under the juriſdiction of Sibenico. It contains a great number of fiſhermen, and a conſiderable number of perſons employed in agriculture. It contains many Roman antiquities, which evidently ſhow that it was a Roman ſtation. It ſeems to be among the number of thoſe iſlands which Pliny calls *Celaduſſæ*, which is ſuppoſed to be an inverſion of δυσκέλαδος, which means *ill ſounding* or *noiſy*. Parvich is not of large extent, but it is extremely fertile. Every product ſucceeds in perfection there: we mean thoſe products of which a very ſhallow ground is ſuſceptible; ſuch as wine, oil, mulberry-trees, and fruit. The aſpect of this iſland is alſo very pleaſant at a diſtance, whereas that of the others adjacent diſguſts the eye, by their too high, rocky, and bare hills. The name of *Parvich* ſeems to have been given it becauſe it is the firſt one meets with on going out of the harbour of Sibenico; for the Illyric word *parvi* ſignifies *firſt*.

PARULIDES, in *Surgery*, tumors and inflammations of the gums, commonly called *gum-boils*. They are to be treated with diſcutients like other inflammatory tumors.

PARUS, or TITMOUSE, a genus of birds belonging to the order of paſſeres. See ORNITHOLOGY *Index*.

PASCAL, BLAISE, one of the greateſt geniuſes and beſt writers France has produced, was born at Clermont in Auvergne, in the year 1623. His father, Stephen Paſcal, born in 1588, and of an ancient family, was preſident of the court of aids in his province: he was a very learned man, an able mathematician, and a friend of Deſcartes. Having an extraordinary tenderneſs for this child, his only ſon, he quitted his office in his province, and went and ſettled at Paris in 1631, that he might be quite at leiſure for the inſtruction of him; and Blaiſe never had any maſter but his father. From his infancy he gave proofs of a very extraordinary capacity: for he deſired to know the reaſon of every thing; and when good reaſons were not given him, he would ſeek for better; nor would he ever yield his aſſent but upon ſuch as appeared to him well grounded. There was room to fear, that with ſuch a caſt of mind he would fall into free thinking, or at leaſt into heterodoxy; yet he was always very far from any thing of this nature.

Paſcal.

What is told of his manner of learning the mathematics, as well as the progreſs he quickly made in that ſcience, ſeems almoſt miraculous. His father, perceiving in him an extraordinary inclination to reaſoning, was afraid leſt the knowledge of the mathematics would hinder his learning the languages. He kept him therefore as much as he could from all notions of geometry, locked up all his books of that kind, and refrained even from ſpeaking of it in his preſence. He could not, however, make his ſon refrain from muſing upon proportions; and one day ſurpriſed him at work with charcoal upon his chamber-floor, and in the midſt of figures. He aſked him what he was doing? I am ſearching, ſays Paſcal, for ſuch a thing; which was juſt the 32d propoſition of the firſt book of Euclid. He aſked him then how he came to think of this? It was, ſays Paſcal, becauſe I have found out ſuch another thing: and ſo going backward, and uſing the names of *bar* and *round*, he came at length to the definitions and axioms he had formed to himſelf. Does it not ſeem miraculous that a boy ſhould work his way into the heart of a mathematical book, without ever having ſeen that or any other book upon the ſubject, or knowing any thing of the terms? Yet we are aſſured of the truth of this by Madame Perrier, and ſeveral other writers, the credit of whoſe teſtimony cannot reaſonably be queſtioned. He had, from henceforward, full liberty to indulge his genius in mathematical purſuits. He underſtood Euclid's Elements as ſoon as he caſt his eyes upon them: and this was not ſtrange; for, as we have ſeen, he underſtood them before. At 16 years of age he wrote a treatiſe of conic ſections, which was accounted by the moſt learned a mighty effort of genius; and therefore it is no wonder that Deſcartes, who had been in Holland a long time, ſhould, upon reading it, chooſe to believe that Mr Paſcal the father was the real author of it. At 19, he contrived an admirable arithmetical machine, which was eſteemed a very wonderful thing, and would have done credit as an invention to any man verſed in ſcience, and much more to ſuch a youth.—About this time his health became impaired, and he was in conſequence obliged to ſuſpend his labours; nor was he in a condition to reſume them till four years after. About that period, having ſeen Torricelli's experiment reſpecting a vacuum and the weight of the air, he turned his thoughts towards theſe objects; and in a conference with Mr Petit, intendant of fortifications, propoſed to make farther reſearches. In conſequence of this idea, he undertook ſeveral new experiments, one of which was as follows:—Having provided a glaſs tube, 46 feet in length, open at one end, and ſealed hermetically at the other, he filled it with red wine, that he might diſtinguiſh the liquor from the tube. He then elevated it in this condition; and having placed it perpendicularly to the horizon, ſtopped up the bottom, and plunged it into a veſſel full of water, to the depth of a foot; after which he opened the extremity of the tube, and the wine deſcended to the diſtance of about 32 feet from the ſurface of the veſſel, leaving a conſiderable vacuum at the upper extremity. He next inclined the tube, and remarked that the wine roſe higher: and having inclined it till the top was within 32 feet of the ground,

Pascal. ground, making the wine thus run out, he found that the water rose in it, so that it was partly filled with that fluid, and partly with wine. He made also a great many experiments with siphons, syringes, bellows, and all kinds of tubes, making use of different liquors, such as quicksilver, water, wine, oil, &c.; and having published them in 1647, dispersed his work throughout all France, and transmitted it also to foreign countries. All these experiments, however, ascertained effects, without demonstrating the causes. Pascal knew that Torricelli conjectured that those phenomena which he had observed were occasioned by the weight of the air (A); and, in order to discover the truth of this theory, he made an experiment at the top and bottom of a mountain in Auvergne, called *Le Puy de Dome*, the result of which gave him reason to conclude that air was weighty. Of this experiment he published an account, and sent copies of it to most of the learned men in Europe. He likewise renewed it at the top of several high towers, such as those of Notre Dame at Paris, St Jacques de la Boucherie, &c.; and always remarked the same difference in the weight of the air, at different elevations. This fully convinced him of the weight of the atmosphere; and from this discovery he drew many useful and important inferences. He composed also a large treatise, in which he thoroughly explained this subject, and replied to all the objections that had been started against it. As he thought this work rather too prolix, and as he was fond of brevity and precision, he divided it into two small treatises, one of which he entitled, A Dissertation on the Equilibrium of Liquors; and the other, An Essay on the Weight of the Atmosphere. These labours procured Pascal so much reputation, that the greatest mathematicians and philosophers of the age proposed various questions to him, and consulted him respecting such difficulties as they could not solve.—Some years after, while tormented with a violent fit of the toothache, he discovered the solution of a problem proposed by Father Mersenne, which had baffled the penetration of all those who had attempted it. This problem was to determine the curve described in the air by the nail of a coach-wheel, while the machine is in motion. Pascal offered a reward of 40 pistoles to any one who should give a satisfactory answer to it. No one, however, having succeeded, he published his own at Paris; but as he began now to be disgusted with the sciences, he would not put his real name to it, but Pascal. sent it abroad under that of A. d'Ettenville.—This was the last work which he published in the mathematics; his infirmities now increasing so much, that he was under the necessity of renouncing severe study, and of living so recluse, that he scarcely admitted any person to see him.

After he had thus laboured abundantly in mathematical and philosophical disquisitions, he forsook those studies and all human learning at once; and determined to know nothing, as it were, for the future, but Jesus Christ and him crucified. He was not 24 years of age, when the reading some pious books had put him upon taking this holy resolution; and he became as great a devotee as any age has produced. Mr Pascal now gave himself up entirely to a state of prayer and mortification. He had always in his thoughts these great maxims, of renouncing all pleasure and all superfluity; and this he practised with rigour even in his illnesses, to which he was frequently subject, being of a very invalid habit of body: for instance, when his sickness obliged him to feed somewhat delicately, he took great care not to relish or taste what he ate. He had no violent affection for those he loved; he thought it sinful, since a man possesses a heart which belongs only to God. He found fault with some discourses of his sister, which she thought very innocent; as if she had said upon occasion, that she had seen a beautiful woman, he would be angry, and tell her, that she might raise bad thoughts in footmen and young people. He frequently wore an iron girdle full of points next to his skin; and when any vain thought came into his head, or when he took particular pleasure in any thing, he gave himself some blows with his elbow, to redouble the prickings, and to recal himself to his duty.

Though Mr Pascal had thus abstracted himself from the world, yet he could not forbear paying some attention to what was doing in it; and he even interested himself in the contest between the Jesuits and the Jansenists. The Jesuits, though they had the popes and kings on their side, were yet decried by the people, who brought up afresh against them the assassination of Henry the Great, and all the old stories that were likely to make them odious. Pascal went farther; and by his *Lettres Provinciales* (B), published in 1656, under the name of *Louis de Montalte*, made them the

(A) Before this period, all those effects which are now known to be produced by the weight of the atmosphere were attributed to Nature's abhorrence of a vacuum.

(B) The origin of these letters was this: for the sake of unbending his mind, Pascal used often to go to Port Royal des Champs, where one of his sisters had taken the veil, and where he had an opportunity of seeing the celebrated Mr Arnaud, and several of his friends. This gentleman's dispute with the doctors of the Sorbonne, who were endeavouring to condemn his opinions, was of course frequently brought upon the carpet. Mr Arnaud, solicited to write a defence, had composed a treatise, which, however, did not meet with approbation, and which he himself considered as a very indifferent work. Pascal being one day in company, some of those present, who were sensible of his abilities, having said to him, "You who are a young man ought to do something;" he took the hint, and composed a letter, which he showed to his friends, and which was so much admired, that they insisted on its being printed. The object of this letter is an explanation of the terms, *next power, sufficient grace*, and *actual grace*; and the author here shows, as well as in two others which followed it, that a regard for the faith was not the motive which induced the doctors of the Sorbonne to enter into dispute with Mr Arnaud, but a desire of oppressing him by ridiculous questions. Pascal, therefore, in other letters which he published afterwards, attacks the Jesuits, whom he believed to be the authors of this quarrel, and in the most elegant style, seasoned with wit and satire, endeavours to render them not only odious but ridiculous. For this

Pascal. the ſubject of ridicule. "Theſe letters (ſays Voltaire) may be conſidered as a model of eloquence and humour. The beſt comedies of Moliere have not more wit than the firſt part of theſe letters; and the ſublimity of the latter part of them is equal to any thing in Boſſuet. It is true, indeed, that the whole book was built upon a falſe foundation; for the extravagant notions of a few Spaniſh and Flemiſh Jeſuits were artfully aſcribed to the whole ſociety. Many abſurdities might likewiſe have been diſcovered among the Dominican and Franciſcan caſuiſts; but this would not have anſwered the purpoſe; for the whole raillery was to be levelled only at the Jeſuits. Theſe letters were intended to prove, that the Jeſuits had formed a deſign to corrupt mankind; a deſign which no ſect or ſociety ever had, or can have." Voltaire calls Paſcal the firſt of their ſatiriſts; for Deſpreaux, ſays he, muſt be conſidered as only the ſecond. In another place, ſpeaking of this work of Paſcal, he ſays, that "examples of all the various ſpecies of eloquence are to be found in it. Though it has been now written almoſt 100 years, yet not a ſingle word occurs in it, favouring of that viciſſitude to which living languages are ſo ſubject. Here then we are to fix the epocha when our language may be ſaid to have aſſumed a ſettled form. The biſhop of Lucon, ſon of the celebrated Buſſy, told me, that aſking one day the biſhop of Meaux what work he would covet moſt to be the author of, ſuppoſing his own performances ſet aſide, Boſſuet replied, The Provincial Letters." Theſe letters have been tranſlated into all languages, and printed over and over again. Some have ſaid, that there were decrees of formal condemnation againſt them; and alſo that Paſcal himſelf, in his laſt illneſs, deteſted them, and repented of having been a Janſeniſt: but both theſe particulars are falſe and without foundation. Father Daniel was ſuppoſed to be the anonymous author of a piece againſt them, entitled, The Dialogues of Cleander and Eudoxus.

Paſcal was only about the age of 30 when theſe letters were publiſhed, yet he was extremely infirm, and his diſorders increaſing ſoon after, ſo much that he conceived his end faſt approaching, he gave up all farther thoughts of literary compoſition. He reſolved to ſpend the remainder of his days in retirement and pious meditation; and with this view he broke off all his former connection, changed his habitation, and ſpoke to no one, not even to his own domeſtics. He made his own bed, fetched his dinner from the kichen, carried it to his apartment, and brought back the plates and diſhes in the evening; ſo that he employed his ſervants only to cook for him, to go to town, and to do ſuch other things as he could not abſolutely do himſelf. In his chamber nothing was to be ſeen but two or three chairs, a table, a bed, and a few books. It had no kind of ornament whatever; he had neither a carpet on the floor nor curtains to his bed; but this did not prevent him from ſometimes receiving viſits; and when his friends appeared ſurpriſed to ſee him thus without furniture, he replied, that he had what was neceſſary, and that any thing elſe would be a ſuperfluity, unworthy of a wiſe man. He employed his time in prayer, and in reading the Holy Scriptures; and he wrote down ſuch thoughts as this exerciſe inſpired. Though his continual infirmities obliged him to uſe very delicate food, and though his ſervants employed the utmoſt care to provide only what was excellent, he never reliſhed what he ate, and ſeemed quite indifferent whether what they brought him was good or bad. When any thing new and in ſeaſon was preſented to him, and when he was aſked, after he had finiſhed his repaſt, how he liked it, he replied, "You ought to have informed me before-hand, I ſhould have then taken notice of it." His indifference in this reſpect was ſo great, that though his taſte was not vitiated, he forbade any ſauce or ragout to be made for him which might excite his appetite. He took without the leaſt repugnance all the medicines that were preſcribed him for the re-eſtabliſhment of his health; and when Madame Perrier, his ſiſter, ſeemed aſtoniſhed at it, he replied ironically, that he could not comprehend how people could ever ſhew a diſlike to a medicine, after being appriſed that it was a diſagreeable one, when they took it voluntarily; for violence or ſurpriſe ought only to produce that effect.

Though Paſcal had now given up intenſe ſtudy, and though he lived in the moſt temperate manner, his health continued to decline rapidly; and his diſorders had ſo enfeebled his organs, that his reaſon became in ſome meaſure affected. He always imagined that he ſaw a deep abyſs on his left ſide, and he never would ſit down till a chair was placed there, to ſecure him from the danger

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this purpoſe he employs the form of dialogue, and introduces an ignorant perſon, as men of the world generally are, who requeſts information reſpecting the queſtions in diſpute from theſe doctors, whom he conſults by propoſing his doubts; and his anſwers to their replies are ſo perſpicuous, pertinent, and juſt, that the ſubject is illuſtrated in the cleareſt manner poſſible. He afterwards expoſes the morality of the Jeſuits, in ſome converſations between him and one of their caſuiſts, in which he ſtill repreſents a man of the world, who ſeeks for inſtruction, and who, hearing maxims altogether new to him, ſeems aſtoniſhed, but ſtill liſtens with moderation. The caſuiſt believes that he is ſincere, and reliſhes theſe maxims; and under this perſuaſion he diſcovers every thing to him with the greateſt readineſs. The other is ſtill ſurpriſed; and as his inſtructor attributes this ſurpriſe only to the novelty of his maxims, he ſtill continues to explain himſelf with the ſame confidence and freedom. This inſtructor is a ſimple kind of man, who is not overburdened with acuteneſs, and who inſenſibly engages himſelf in details which always become more particular. The perſon who liſtens, wiſhing neither to contradict him nor to ſubſcribe to his doctrine, receives it with an ambiguous kind of raillery; which, however, ſufficiently ſhows what opinion he entertains of it. The Jeſuits reproached the author with having employed only raillery againſt them, and with having miſrepreſented ſeveral paſſages of their authors; which induced Paſcal to write eight more in vindication of himſelf. All theſe letters, in number 18, written in a ſtyle altogether new in France, appeared in 4to, one after another, from the month of January 1656, to the month of March of the year following.

Pascal.

danger which he apprehended. His friends did every thing in their power to banish this melancholy idea from his thoughts, and to cure him of his error, but without the desired effect: for though he would become calm and composed for a little, the phantom would in a few moments again make its appearance and torment him. The cause of his seeing this singular vision for the first time, is said to have been as follows: His physicians, alarmed on account of the exhausted state to which he was reduced, had advised him to substitute easy and agreeable exercise for the fatiguing labours of the closet. One day, in the month of October 1654, having gone according to custom to take an airing on the Pont de Neuilly, in a coach and four, the two first horses suddenly took fright, opposite to a place where there was no parapet, and threw themselves violently into the Seine; but the traces luckily giving way, the carriage remained on the brink of the precipice. The shock which Pascal, in his languishing situation, must have received from this dreadful accident, may easily be imagined. It threw him into a fit, which continued for some time, and it was with great difficulty that he could be restored to his senses. After this period his brain became so deranged, that he was continually haunted by the remembrance of his danger, especially when his disorders prevented him from enjoying sleep. To the same cause was attributed a kind of vision or ecstasy that he had some time after: a memorandum of which he preserved during the remainder of his life in a bit of paper, put between the cloth and the lining of his coat, and which he always carried about him. Some of the Jesuits had the baseness and inhumanity to reproach this great genius with the derangement of his organs. In the Dictionary of Jansenist Books, he is called a *hypochondriac*, and a man of a *wrong head* and a *bad heart*. But, as a celebrated writer has observed, Pascal's disorder had in it nothing more surprising or disgraceful than a fever, or the vertigo. During the last years of his life, in which he exhibited a melancholy example of the humiliating reverses which take place in this transitory scene, and which, if properly considered, might teach mankind not to be too proud of those abilities which a moment may take from them, he attended all the salutations (c), visited every church in which relicks were exposed, and had always a spiritual almanack, which gave an account of all those places where particular acts of devotion were performed. On this occasion it has been said, that "Religion renders great minds capable of little things, and little minds capable of great."

In company, Pascal was distinguished by the amiableness of his behaviour; by his easy, agreeable, and instructive conversation, and by great modesty. He possessed a natural kind of eloquence, which was in a manner irresistible. The arguments he employed for the most part produced the effect which he proposed; and though his abilities entitled him to assume an air of superiority, he never displayed that haughty and imperious tone which may often be observed in men of shining talents. The philosophy of this great man consisted in renouncing all pleasure, and every superfluity. He not only denied himself the most common gratifications; but he took also without reluctance, and even with pleasure, either as nourishment or as remedies, whatever was disagreeable to the senses; and he every day retrenched some part of his dress, food, or other things, which he considered as not absolutely necessary. Towards the close of his life, he employed himself wholly in pious and moral reflections, writing down those which he judged worthy of being preserved. The first piece of paper he could find was employed for this purpose; and he commonly put down only a few words of each sentence, as he wrote them merely for his own use. The bits of paper upon which he had written these thoughts, were found after his death filed upon different pieces of string, without any order or connection; and being copied exactly as they were written, they were afterwards arranged and published.

The celebrated Bayle, speaking of this great man, says, A hundred volumes of sermons are not of so much avail as a simple account of the life of Pascal. His humility and his devotion mortified the libertines more than if they had been attacked by a dozen of missionaries. In a word, Bayle had so high an idea of this philosopher, that he calls him *a paradox in the human species*. "When we consider his character (says he), we are almost inclined to doubt that he was born of a woman, like the man mentioned by Lucretius:

"*Ut vix humana videatur stirpe creatus.*"

Mr Pascal died at Paris the 19th of August 1662, aged 39 years. He had been some time about a work against atheists and infidels, but did not live long enough to digest the materials he had collected. What was found among his papers was published under the title of *Pensées*, &c. or *Thoughts upon religion and other subjects*, and has been much admired. After his death appeared also two other little tracts; one of which is intitled, *The equilibrium of fluids;* and the other, *The weight of the mass of air*.

The works of Pascal were collected in five volumes 8vo, and published at the Hague by De Tune, and at Paris by Nyon senior, in 1779. This edition of Pascal's works may be considered as the first published; at least the greater part of them were not before collected into one body; and some of them had remained only in manuscript. For this collection, the public were indebted to the abbé Bossu, and Pascal deserved to have such an editor. "This extraordinary man (says he) inherited from nature all the powers of genius. He was a geometrician of the first rank, a profound reasoner, and a sublime and elegant writer. If we reflect, that in a very short life, oppressed by continual infirmities, he invented a curious arithmetical machine, the elements of the calculation of chances, and a method of resolving various problems respecting the cycloid; that he fixed in an irrevocable manner the wavering opinions of the learned respecting the weight of the air; that he wrote one of the completest works which exist in the French language; and that in his Thoughts there are passages, the

(c) Certain solemn prayers, which are repeated at certain hours, and on certain days, in the Popish churches.

the depth and beauty of which are incomparable—we shall be induced to believe, that a greater genius never existed in any age or nation. All those who had occasion to frequent his company in the ordinary commerce of the world, acknowledged his superiority; but it excited no envy against him, as he was never fond of showing it. His conversation instructed, without making those who heard him sensible of their own inferiority; and he was remarkably indulgent towards the faults of others. It may be easily seen by his Provincial Letters, and by some of his other works, that he was born with a great fund of humour, which his infirmities could never entirely destroy. In company, he readily indulged in that harmless and delicate raillery which never gives offence, and which greatly tends to enliven conversation; but its principal object generally was of a moral nature. For example, ridiculing those authors who say, *My Book, my Commentary, my History*, they would do better (added he) to say, *Our Book, our Commentary, our History*; since there are in them much more of other people's than their own." An elegant Latin epitaph was inscribed on his tomb.

PASCHAL, something belonging to the passover, or Easter. See PASSOVER and EASTER.

PAS-EP-A, the chief of the Lamas, particularly eminent for having invented characters for the Moguls. He was much esteemed by the Chinese, though the literati exclaimed against the manner in which the people demonstrated their affection. There is still at Pekin a *myau* or temple, built in honour of Pas-ep-a in the time of the Mogul emperors. He died in 1279.

PASIGRAPHY (from πας, *omnis*, and γραφω, *scribo*), the art of writing on any subject whatever, so as to be universally understood by all nations upon earth. The idea of establishing such a language is deemed by many extremely fanciful and absurd, while the practicability of it is as strenuously contended for by others. Hints respecting such a system of writing as might be understood by all mankind, are to be met with in the writings of many eminent philosophers; but if such an attempt failed in the hands of a Leibnitz, a Kircher, a Becher, a Wilkins, and some others, it is at least to be presumed, that the execution of a pasigraphy, or universal language, will always be found to bear a striking analogy to the chimerical sentiments which were formerly entertained respecting the doctrines of the quadrature of the circle, the multiplication of the cube, the philosopher's stone, or perpetual motion, all of which have been finely ridiculed by Dean Swift in his idea of circular shot. Kant is clearly of opinion, however, that such a pasigraphy falls within the limits of possibility;—nay, he even asserts, that it will actually be established at some future period. And, while none of its admirers venture to bid us believe that it will ever be universally spoken or understood, they confidently think, that, by means of it, the valuable labours of erudition and human genius will be effectually prevented from ever falling into oblivion. See a Memoir on this subject in Nicholson's Journal, ii. 342. 4to.

PASIPHAE, in fabulous history, daughter of the Sun by Perseis, who married Minos king of Crete. She disgraced herself by an unnatural passion for a bull, which we are told she was enabled to gratify by means of the artist Dædalus. This celebrated bull had been given to Minos by Neptune, to be offered on his altars. But as the monarch refused to sacrifice the animal on account of his beauty, the god revenged his disobedience by inspiring Pasiphaë with an unnatural love for him. This fable, which is universally believed by the poets, who observe, that the minotaur was the fruit of this infamous commerce, is refuted by some writers; who suppose that the infidelity of Pasiphaë to her husband was betrayed in her affection for an officer of the name of Taurus, and that Dædalus, by permitting his house to be the asylum of the two lovers, was looked upon as accessory to the gratification of Pasiphaë's lust. From this amour with Taurus, as it is farther remarked, the queen became mother of twins; and the name of *Minotaurus* arises from the resemblance of the children to the husband and the lover of Pasiphaë. Minos had four sons by Pasiphaë, Castreus, Deucalion, Glaucus, and Androgeus; and three daughters, Hecate, Ariadne, and Phædra.

PASQUIN, a mutilated statue at Rome, in a corner of the palace of the Ursini. It takes its name from a cobler of that city called *Pasquin*, famous for his sneers and gibes, and who diverted himself by passing his jokes on all that went through that street. After his death, as they were digging up the pavement before his door, they found in the earth the statue of an ancient gladiator, well cut, but maimed and half-spoiled: this they set up in the place where it was found, and by common consent named it *Pasquin*. Since that time all satires are attributed to that figure; and are either put into its mouth, or pasted upon it, as if they were written by Pasquin redivivus; and these are addressed by Pasquin to Marforio, another statue at Rome. When Marforio is attacked, Pasquin comes to his assistance; and, when Pasquin is attacked, Marforio assists him in his turn; that is, the people make the statues speak just what they please.

PASQUINADE, a satirical libel fastened to the statue of Pasquin: these are commonly short, witty, and pointed; and from hence the term has been applied to all lampoons of the same cast.

PASS, or PASSADE, in fencing, an advance or leap forward upon the enemy. Of these there are several kinds; as passes within, above, beneath, to the right, the left, and passes under the line, &c. The measure of the pass is when the swords are so near as that they may touch one another.

PASS, in a military sense, a strait and difficult passage, which shuts up the entrance into a country.

PASS Parole, in military affairs, a command given at the head of an army, and thence communicated to the rear, by passing it from mouth to mouth.

PASSADE, in the manege, is a turn or course of a horse backwards or forwards on the same spot of ground. Hence there are several sorts of passades, according to the different ways of turning, in order to part or return upon the same tread, which is called *closing the passade*; as the passade of one time, the passade of five times, and the raised or high passades, into which the demivolts are made into curvets. See HORSEMANSHIP.

North-west PASSAGE. / *North-east PASSAGE.* } See *NORTH-West Passage*, *NORTH-East Passage*, and POLE.

Right of PASSAGE, in commerce, is an imposition or duty exacted by some princes, either by land or sea, in certain close and narrow places in their territories, on all

all veſſels and carriages, and even ſometimes on perſons or paſſengers, coming in or going out of ports, &c. The moſt celebrated paſſage of this kind in Europe is the Sound: the dues for paſſing which ſtrait belong to the king of Denmark, and are paid at Elſinore or Cronenburg.

PASSANT, in *Heraldry*, a term applied to a lion or other animal in a ſhield, appearing to walk leiſurely: for moſt beaſts, except lions, the *trippant* is frequently uſed inſtead of *paſſant*.

PASSAU, an ancient, handſome, and celebrated town of Germany, in Lower Bavaria, with a biſhop's ſee and fort. The houſes are well built, and the cathedral is thought to be the fineſt in all Germany. It is divided into four parts, three of which are fortified; but the other is only a ſuburb, and has nothing but an old caſtle in which the biſhop generally reſides. It is ſeated at the confluence of the rivers Inn and Iltz, in E. Long. 13. 34. N. Lat. 48. 26.

PASSAU, a biſhopric of Germany, lying between Lower Bavaria, Auſtria, and Bohemia. It extends not above 20 miles where largeſt; and has no conſiderable place, except the capital, which is of the ſame name.

PASSERES, the name of one of the orders (the 6th) into which the claſs of birds is divided. See ORNITHOLOGY *Index*.

PASSIFLORA, or PASSION FLOWER; a genus of plants belonging to the gynandria claſs; and in the natural method ranking under the 34th order, *Cucurbitaceæ*. See BOTANY *Index*.

PASSION, is a word of which, as Dr Reid obſerves, the meaning is not preciſely aſcertained either in common diſcourſe or in the writings of philoſophers. In its original import, it denotes every *feeling* of the mind occaſioned by an extrinſic cauſe; but it is generally uſed to ſignify ſome *agitation* of mind, oppoſed to that ſtate of tranquillity in which a man is moſt maſter of himſelf. That it was thus uſed by the Greeks and Romans, is evident from Cicero's rendering πάθος, the word by which the philoſophers of Greece expreſſed it, by *perturbatio* in Latin. In this ſenſe of the word, paſſion cannot be itſelf a *diſtinct* and *independent* principle of action; but only an occaſional degree of vehemence given to thoſe diſpoſitions, deſires, and affections, which are at all times preſent to the mind of man; and that this is its proper ſenſe, we need no other proof than that paſſion has always been conceived to bear analogy to a ſtorm at ſea or to a tempeſt in the air.

With reſpect to the number of paſſions of which the mind is ſuſceptible, different opinions have been held by different authors. Le Brun, a French writer on painting, juſtly conſidering the expreſſion of the paſſions as a very important as well as difficult branch of his art, has enumerated no fewer than twenty, of which the ſigns may be expreſſed by the pencil on canvaſs. That there are ſo many different ſtates of mind producing different effects which are viſible on the features and the geſtures, and that thoſe features and geſtures ought to be diligently ſtudied by the artiſt, are truths which cannot be denied; but it is abſurd to conſider all theſe different ſtates of mind as *paſſions*, ſince tranquillity is one of them, which is the reverſe of paſſion.

The common diviſion of the paſſions into *deſire* and *averſion*, *hope* and *fear*, *joy* and *grief*, *love* and *hatred*,

has been mentioned by every author who has treated of them, and needs no explication; but it is a queſtion of ſome importance in the philoſophy of the human mind, whether theſe different paſſions be each a degree of an original and innate diſpoſition, diſtinct from the diſpoſitions which are reſpectively the foundations of the other paſſions, or only different modifications of one or two general diſpoſitions common to the whole race.

The former opinion is held by all who build their ſyſtem of metaphyſics upon a number of diſtinct internal ſenſes; and the latter is the opinion of thoſe who, with Locke and Hartley, reſolve what is commonly called inſtinct into an early aſſociation of ideas. (See INSTINCT). That without deliberation mankind inſtantly feel the paſſion of fear upon the apprehenſion of danger, and the paſſion of anger or reſentment upon the reception of an injury, are truths which cannot be denied: and hence it is inferred, that the ſeeds of theſe paſſions are innate in the mind, and that they are not generated, but only ſwell to magnitude on the proſpect of their reſpective objects. In ſupport of this argument, it has been obſerved that children, without any knowledge of their danger, are inſtinctively afraid on being placed on the brink of a precipice; and that this paſſion contributes to their ſafety long before they acquire, in any degree equal to their neceſſities, the exerciſe of their rational powers. Deliberate anger, cauſed by a voluntary injury, is acknowledged to be in part founded on reaſon and reflection; but where anger impels one ſuddenly to return a blow, even without thinking of doing miſchief, the paſſion is inſtinctive. In proof of this, it is obſerved, that inſtinctive anger is frequently raiſed by bodily pain, occaſioned even by a ſtock or a ſtone, which inſtantly becomes an object of reſentment, that we are violently incited to cruſh to atoms. Such conduct is certainly not rational, and therefore it is ſuppoſed to be neceſſarily inſtinctive.

With reſpect to other paſſions, ſuch as the luſt of power, of fame, or of knowledge, innumerable inſtances, ſays Dr Reid, occur in life, of men who ſacrifice to them their eaſe, their pleaſure, and their health. But it is abſurd to ſuppoſe that men ſhould ſacrifice the end to what they deſire only as means of promoting that end; and therefore he ſeems to think that theſe paſſions muſt be innate. To add ſtrength to this reaſoning he obſerves, that we may perceive ſome degree of theſe principles even in brute animals of the moſt ſagacious kind, who are not thought to deſire means for the ſake of ends which they have in view.

But it is in accounting for the paſſions which are diſintereſted that the advocates for innate principles ſeem moſt completely to triumph. As it is impoſſible not to feel the paſſion of pity upon the proſpect of a fellow creature in diſtreſs, they argue, that the baſis of that paſſion muſt be innate; becauſe pity, being at all times more or leſs painful to the perſon by whom it is felt, and frequently of no uſe to the perſon who is its object, it cannot in ſuch inſtances be the reſult of deliberation, but merely the exertion of an original inſtinct. The ſame kind of reaſoning is employed to prove that gratitude is the exerciſe of an innate principle. That good offices are, by the very conſtitution of our nature, apt to produce good will towards the benefactor, in good and bad men, in the ſavage and in the civilized, cannot ſurely be denied by any one in the leaſt acquainted with

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human nature. We are grateful not only to the benefactors of ourſelves as individuals, but alſo to the benefactors of our country; and *that*, too, when we are conſcious that from our gratitude neither they nor we can reap any advantage. Nay, we are impelled to be grateful even when we have reaſon to believe that the objects of our gratitude know not our exiſtence. This paſſion cannot be the effect of reaſoning, or of aſſociation founded on reaſoning; for, in ſuch caſes as thoſe mentioned, there are no principles from which reaſon can infer the propriety or uſefulneſs of the feeling. That *public ſpirit*, or the affection which we bear to our country, or to any ſubordinate community of which we are members, is founded on inſtinct, is deemed ſo certain, that the man deſtitute of this affection, if there be any ſuch, has been pronounced as great a monſter as he who has two heads.

All the diſintereſted paſſions are founded on what philoſophers have termed *benevolent affection*. Inſtead therefore of inquiring into the origin of each paſſion ſeparately, which would ſwell this article to no purpoſe, let us liſten to one of the fineſt writers as well as ableſt reaſoners of the age, treating of the origin of benevolent affection. "We may lay it down as a principle (ſays Dr Reid *), that all benevolent affections are in their nature agreeable; that it is eſſential to them to deſire the good and happineſs of their objects; and that their objects muſt therefore be beings capable of happineſs. A thing may be deſired either on its own account, or as the means in order to ſomething elſe. That only can properly be called an object of deſire which is deſired upon its own account; and therefore I conſider as benevolent thoſe affections only which deſire the good of their object ultimately, and not as means in order to ſomething elſe. To ſay that we deſire the good of others, only to procure ſome pleaſure or good to ourſelves, is to ſay that there is no benevolent affection in human nature. This indeed has been the opinion of ſome philoſophers both in ancient and in later times. But it appears as unreaſonable to reſolve all benevolent affections into ſelf-love, as it would be to reſolve hunger and thirſt into ſelf-love. Theſe appetites are neceſſary for the preſervation of the individual. Benevolent affections are no leſs neceſſary for the preſervation of ſociety among men; without which men would become an eaſy prey to the beaſts of the field. The benevolent affections planted in human nature, appear therefore no leſs neceſſary for the preſervation of the human ſpecies than the appetites of hunger and thirſt." In a word, pity, gratitude, friendſhip, love, and patriotiſm, are founded on different benevolent affections; which our learned author holds to be original parts of the human conſtitution."

* *Eſſays on the Active Powers of Man.*

This reaſoning has certainly great force; and if authority could have any weight in ſettling a queſtion of this nature, we know not that name to which greater deference is due than the name of him from whom it is taken. Yet it muſt be confeſſed that the philoſophers, who conſider the affections and paſſions as early and deep rooted aſſociations, ſupport their opinion with very plauſible arguments. On their principles we have endeavoured elſewhere to account for the paſſions of fear and love, (ſee INSTINCT and LOVE); and we may here ſafely deny the truth of what has been ſtated reſpecting fear, which ſeems to militate againſt that account. We have attended with much ſolicitude to the actions of children; and have no reaſon to think that they feel terror on the brink of a precipice till they have been repeatedly warned of their danger in ſuch ſituations by their parents or their keepers. Every perſon knows not only that they have no original or inſtinctive dread of fire, which is as dangerous to them as any precipice; but that it is extremely difficult to keep them from that deſtructive element till they are either capable of weighing the force of arguments, or have repeatedly experienced the pain of being burnt by it. With reſpect to ſudden reſentment, we cannot help conſidering the argument, which is brought in proof of its being inſtinctive, as proving the contrary in a very forcible manner. Inſtinct is ſome myſterious influence of God upon the mind exciting to actions of beneficial tendency: but can any benefit ariſe from wreaking our impotent vengeance on a ſtock or a ſtone? or is it ſuppoſable that a Being of infinite wiſdom would excite us to actions ſo extravagantly fooliſh? We learn from experience to defend ourſelves againſt rational or ſenſible enemies by retaliating the injuries which they inflict upon us; and if we have been often injured in any particular manner, the idea of that injury becomes in time ſo cloſely aſſociated with the means by which it has been conſtantly repelled, that we never receive ſuch an injury—a blow for inſtance—without being prompted to make the uſual retaliation, without reflecting whether the object be ſenſible or inſenſible. So far from being inſtinctive does reſentment appear to us, that we think an attentive obſerver may eaſily perceive how the ſeeds of it are gradually infuſed into the youthful mind; when the child, from being at firſt a timid creature ſhrinking from every pain, learns by degrees to return blow for blow and threat for threat.

But inſtead of urging what appears to ourſelves of moſt weight againſt the inſtinctive ſyſtem, we ſhall lay before our readers a few extracts from a diſſertation on the origin of the paſſions, by a writer whoſe elegance of language and ingenuity of inveſtigation do honour to the ſchool of Hartley.

"When an infant is born (ſays Dr Sayers †), there is every reaſon to ſuppoſe that he is born without ideas. Theſe are rapidly communicated through the medium of the ſenſes. The ſame ſenſes are alſo the means of conveying to him pleaſure and pain. Theſe are the hinges on which the paſſions turn: and till the child is acquainted with theſe ſenſations, it would appear that no paſſion could be formed in his mind; for till he has felt pleaſure and pain, how can he deſire any object, or wiſh for its removal? How can he either love or hate? Let us obſerve then the manner in which love and hatred are formed; for on theſe paſſions depend all the reſt. When a child endures pain, and is able to detect the cauſe of it, the idea of pain is connected in his mind with that of the thing which produced it; and if the object which occaſioned pain be again preſented to the child, the idea of pain aſſociated with it ariſes alſo. This idea conſequently urges the child to avoid or to remove the object; and thus ariſes the paſſion of diſlike or hatred. In the ſame manner, the paſſion of liking or love is readily formed in the mind of a child from the aſſociation of pleaſant ideas with certain objects which produced them.

† *Diſquiſitions Metaphyſical and Literary.*

"The paſſions of hope and fear are ſtates of the mind

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mind depending upon the good or bad profpects of gratifying love or hatred; and joy or forrow arifes from the final fuccefs or difappointment which attends the exertions produced by love or by hatred. Out of thefe paffions, which have all a perceptible relation to our own good, and are univerfally acknowledged to be felfifh, all our other paffions are formed."

To account for the paffions called *difinterefted*, he obferves, that in the hiftory of the human mind we find many inftances of our dropping an intermediate idea, which has been the means of our connecting two other ideas together; and that the affociation of thefe two remains after the link which originally united them has vanifhed. Of this fact the reader will find fufficient evidence in different articles of this work (fee INSTINCT, N° 19. and METAPHYSICS, N° 101.): and, to apply it to the difinterefted paffions, let us fuppofe, with Dr Sayers, that any individual has done to us many offices of kindnefs, and has confequently much contributed to our happinefs; it is natural for us to feek with fome anxiety for the continuance of thefe pleafures which he is able to communicate. But we foon difcern, that the fureft way of obtaining the continuance of his friendly offices is to make them, as much as poffible, a fource of pleafure to himfelf. We therefore do every thing in our power to promote his happinefs in return for the good he has conferred upon us, that thus we may attach him to us as much as we are able. Hitherto all is plainly felfifh. We have been evidently endeavouring, for the fake of our own future gratification, to promote the happinefs of this perfon; but obferve the confequence. We have thus, by contemplating the advantage, to be derived to ourfelves from promoting the profperity of our friend, learned to affociate a fet of pleafant ideas with his happinefs; but the link which has united them gradually efcapes us, while the union itfelf remains. Continuing to affociate pleafure with the well-being of our friend, we endeavour to promote it for the fake of his *immediate* gratification, without looking farther; and in this way his happinefs, which was firft attended to only as a means of future enjoyment, finally becomes an end. Thus then the paffion which was originally felfifh, is at length *difinterefted*; its gratification being completed merely by its fuccefs in promoting the happinefs of another.

In this way does our author account for the origin of gratitude; which at laft becomes a habit, and flows fpontaneoufly towards every man who has either been or intended to be our benefactor. According to him, it is eafy to obferve alfo, that from affociating pleafure with the happinefs of an individual when we procure it ourfelves, it muft of courfe foon follow, that we fhould experience pleafure from a view of his happinefs any way produced; fuch happinefs raifing at all times pleafant ideas when it is prefented to our minds. This is another feature of a difinterefted affection, to feel delight from the mere increafe of happinefs in the object whom we love.

"It may be objected, perhaps, that parents feem to have an *inftinctive* difinterefted love of their offspring: but furely the love of a parent (A) for a new-born infant is not ufually equal to that for a child of four or five years old. When a child is firft born, the profpect and hopes of future pleafure from it are fufficient to make a parent anxious for its prefervation. As the child grows up, the hope of future enjoyment from it muft increafe: hence would pleafure be affociated with the well-being of the child, the love of which would of courfe become in due time difinterefted."

Our author does not analyze *pity*, and trace it to its fource in felfifhnefs; but he might eafily have done it, and it has been ably done by his mafter. Pity or compaffion is the uneafinefs which a man feels at the mifery of another. It is generated in every mind during the years of childhood; and there are many circumftances in the conftitution of children, and in the mode of their education, which make them particularly fufceptible of this paffion. The very appearance of any kind of mifery which they have experienced, or of any figns of diftrefs which they underftand, excite in their minds painful feelings, from the remembrance of what they have fuffered, and the apprehenfion of their fuffering it again. We have feen a child a year old highly entertained with the noife and ftruggles made by its elder brother when plunged naked into a veffel filled with cold water. This continued to be the cafe for many days, till it was thought proper to plunge the younger as well as the elder; after which the daily entertainment was foon at an end. The little creature had not been itfelf plunged above twice till it ceafed to find diverfion in its brother's fufferings.—On the third day it cried with all the fymptoms of the bittereft anguifh upon feeing its brother plunge, though no preparation was then made for plunging itfelf; but furely this was not difinterefted fympathy, but a feeling wholly felfifh, excited by the remembrance of what it had fuffered itfelf, and was apprehenfive of fuffering again. In a fhort time, however, the painful feelings accompanying the fight of its brother's ftruggles, and the found of his cries, were doubtlefs fo affociated with that fight and that found, that the appearance of the latter would have brought the former

(A) That this is true of the father is certain; but it may be queftioned whether it be equally true of the mother. A woman is no fooner delivered of her infant, than fhe careffes it with the utmoft poffible fondnefs. We believe, that if fhe were under the neceffity of making a choice between her child of four years, and her infant an hour old, fhe would rather be deprived of the latter than of the former; but we are not convinced that this would proceed from a lefs degree of affection to the infant than to the child. She knows that the child has before his fourth year efcaped many dangers which the infant muft encounter, and may not efcape; and it is therefore probable that her choice would be the refult of prudent reflection. Though we are not admirers of that philofophy which fuppofes the human mind a bundle of inftincts, we can as little approve of the oppofite fcheme which allows it no inftincts at all. The στοργη of a mother to her new-born infant is undoubtedly inftinctive, as the only thing which at that moment can be affociated with it in her mind is the pain fhe has fuffered in bringing it to the world.

Passion.

former along with them, even though the child might have been no longer under apprehension of a plunging itself. This association, too, would soon be transferred to every boy in the same circumstances, and to similar sounds and struggles, from whatever cause they might proceed.

Thus, as Dr Hartley observes †, "when several children are educated together, the pains, the denials of pleasure, and the sorrows which affect one generally extend to all in some degree, often in an equal one. When their parents, companions, or attendants are sick, or afflicted, it is usual to raise in their minds the nascent ideas of pains and miseries by such words and signs as are suited to their capacities. They also find themselves laid under many restraints, on account of the sickness or affliction of others; and when these and such like circumstances have raised in their minds desires to remove the causes of their own internal feelings, i. e. to ease the miseries of others, a variety of internal feelings and desires become so blended and associated together, as that no part can be distinguished separately from the rest, and the child may properly be said to have compassion. The same sources of compassion remain, though with some alteration, during our whole progress through life. This is so evident, that a reflecting person may plainly discern the constituent parts of his compassion while they are yet the mere internal, and, as one may say, selfish feelings above mentioned; and before they have put on the nature of compassion by a coalescence with the rest. Agreeably to this method of reasoning, it may be observed, that persons whose nerves are easily irritable, and those who have experienced great trials and afflictions, are in general more disposed to compassion than others; and that we are most apt to pity others in those diseases and calamities which we either have felt or of which we apprehend ourselves to be in danger."

† *Observations on Man.*

The origin of patriotism and public spirit is thus traced by Dr Sayers: "The pleasures which our country affords are numerous and great. The wish to perpetuate the enjoyment of these pleasures, includes the wish to promote the safety and welfare of our country, without which many of them would be lost. All this is evidently selfish; but, as in the progress of gratitude, it finally becomes disinterested. Pleasant ideas are thus strongly connected with the welfare of our country, after the tie which first bound them together has escaped our notice. The prosperity which was at first desirable as the means of future enjoyment, becomes itself an end; we feel delight in such prosperity, however produced; and we look not beyond this immediate delight. It is thus not difficult to observe in what manner a general and disinterested benevolence takes place in a mind which has already received pleasure from the happiness of a few; the transition is easy towards associating it with *happiness in general*, with the happiness of any being whether produced by ourselves or by any other cause whatever."

From this reasoning, our author concludes, that all our passions may be traced up to original feelings of regard for ourselves. "Thus (in the forcible language of a learned writer * of the same school) does self-love, under the varying appearance of natural affection, domestic relation, and the connexions of social habitude, at first work blindly on, obscure and deep in dirt: But as it makes its way, it continues rising, till it emerges into light; and then suddenly expiring, leaves behind it the fairest issue,"—benevolent affection.

* *Warburton.*

> Self-love partook the path it first pursu'd,
> And found the private in the public good.

Thus have we stated the two opposite theories respecting the origin of passions in the mind, and given our readers a short specimen of the reasonings by which they are supported by their respective patrons. Were we called upon to decide between them, we should be tempted to say, that they have both been carried to extremes by some of their advocates, and that the truth lies in the middle between them. "It is impossible † but that creatures capable of pleasant and painful sensations, should love and choose the one, and dislike and avoid the other. No being who knows what happiness and misery are, can be supposed indifferent to them, without a plain contradiction. Pain is not a *possible* object of desire, nor happiness of *aversion*."—To prefer a greater good though distant, to a less good that is present; or to choose a present evil, in order to avoid a greater future evil—is indeed wise and rational conduct; but to choose evil ultimately, is absolutely impossible. Thus far then must be admitted, that every being possessed of sense and intellect, necessarily desires his own good as soon as he knows what it is; but if this knowledge be not innate, neither can the desire. Every human being comes into the world with a capability of knowledge, and of course with a capability of affections, desires, and passions; but it seems not to be conceivable how he can actually love, or hate, or dread any thing, till he know whether it be good, or ill, or dangerous. If, therefore, we have no innate ideas, we cannot possibly have innate desires or aversions. Those who contend that we have, seem to think, that without them reason would be insufficient, either for the preservation of the individual or the continuation of the species; and some writers have alleged, that if our affections and passions were the mere result of early associations, they would necessarily be more capricious than we ever find them. But this objection seems to arise from their not rightly understanding the theory of their antagonists. The disciples of Locke and Hartley do not suppose it possible for any man in society to prevent such associations from being formed in his mind as shall necessarily produce desires and aversions; far less do they think it possible to form associations of ideas utterly repugnant, so as to desire that as good which his senses and intellect have experienced to be evil. Associations are formed by the very same means, and at the very same time, that ideas and notions are impressed upon the mind; but as pain is never mistaken for pleasure by the senses, so an object which has given us only pain, is never associated with any thing that makes it desireable. We say an object that has given us only pain, because it is possible to form such an association between life and the loss of a limb, as to make us grateful to the surgeon by whom it was amputated. Associations being formed according to the same laws by which knowledge is acquired, it by no means follows that passions resulting from them should be more capricious than they are found to be; and they certainly are sufficiently capricious to make us suspect that the greater part of them has this origin, rather than that they are all infused in the mind by the immediate agency of the Creator;

† *Dr Price's Review, &c.*

Creator. If man be a being formed with no innate ideas, and with no other instinctive principles of action than what are absolutely necessary to preserve his existence and perpetuate the species, it is easy to perceive why he is placed in this world as in a state of probation, where he may acquire habits of virtue to fit him for a better. It is likewise easy to perceive why some men are better than others, and why some are the slaves of the most criminal passions. But all this is unintelligible, upon the supposition that the seeds of every passion are innate, and that man is a compound of reason and of instincts so numerous and various as to suit every circumstance in which it can be placed.

If passions, whatever be their origin, operate instantaneously, and if they be formed according to fixed laws, it may be thought a question of very little importance whether they be instinctive or acquired.—This was long our own opinion; but we think, that upon maturer reflection we have seen reason to change it. If passions be the result of early associations, it is of the utmost consequence that no improper associations be formed in the minds of children, and that none of their unreasonable desires be gratified. Upon this theory it seems indeed to depend almost wholly upon education, whether a child shall become a calm, benevolent, steady, and upright man; or a passionate, capricious, selfish miscreant. By teaching him to resent every petty injury, the seeds of irascibility are sown in his mind, and take such root, that before the age of manhood he becomes intolerable to all with whom he must converse. By exciting numberless desires in his youthful mind, and instantly gratifying them, you make him capricious and impatient of disappointment; and by representing other children as in any degree inferior to him, you inspire him with the hateful passion of pride. According to the instinctive theory, education can only augment or diminish the strength of passions; according to the other theory, it is the source of by far the greater part of them. On either supposition, parents should watch with solicitude over the actions of their children; but they will surely think themselves obliged to be doubly watchful, if they believe, that through their neglect their children may acquire hateful passions, to which, if properly educated, they might have remained strangers through their whole lives. And let it be remembered, that this solicitude should begin at an early period; because the mind is susceptible of deep associations much sooner than is sometimes imagined. Without this susceptibility, no language could be learned; and therefore a child by the time he learns to speak, may have planted in his mind the seeds of passions, on the just regulation and subordination of which depends in a great measure the happiness of mankind. See *MORAL Philosophy*, Part I. chap. 1. & 2. Part III. N° 216.

PASSIONS and Emotions, difference between them. See *EMOTIONS and Passions*.

External Signs of Emotions and PASSIONS. So intimately connected are the soul and body, that every agitation in the former produces a visible effect upon the latter. There is, at the same time, a wonderful uniformity in that operation; each class of emotions and passions being invariably attended with an external appearance peculiar to itself. These external appearances, or signs, may not improperly be considered as a natural language, expressing to all beholders emotions and passions as they rise in the heart. Hope, fear, joy, grief, are displayed externally: the character of a man can be read in his face; and beauty, which makes so deep an impression, is known to result, not so much from regular features and a fine complexion, as from good nature, good sense, sprightliness, sweetness, or other mental quality, expressed upon the countenance. Though perfect skill in that language be rare, yet what is generally known is sufficient for the ordinary purposes of life. But by what means we come to understand the language, is a point of some intricacy. It cannot be by sight merely; for upon the most attentive inspection of the human visage, all that can be discerned are, figure, colour, and motion, which, singly or combined, never can represent a passion nor a sentiment: the external sign is indeed visible; but to understand its meaning, we must be able to connect it with the passion that causes it; an operation far beyond the reach of eye-sight. Where then is the instructor to be found that can unveil this secret connexion? If we apply to experience, it is yielded, that from long and diligent observation, we may gather, in some measure, in what manner those we are acquainted with express their passions externally; but with respect to strangers, we are left in the dark; and yet we are not puzzled about the meaning of these external expressions in a stranger, more than in a bosom companion. Further, had we no other means but experience for understanding the external signs of passion, we could not expect any uniformity, nor any degree of skill, in the bulk of individuals; yet matters are so much better ordered, that the external expressions of passion form a language understood by all, by the young as well as the old, by the ignorant as well as the learned: We talk of the plain and legible characters of that language; for undoubtedly we are much indebted to experience, in deciphering the dark and more delicate expressions. Where then shall we apply for a solution of this intricate problem, which seems to penetrate deep into human nature? Undoubtedly if the meaning of external signs be not derived to us from sight, nor from experience, there is no remaining source whence it can be derived but from nature.

We may then venture to pronounce, with some degree of confidence, that man is provided by nature with a sense or faculty that lays open to him every passion by means of its external expressions. And we cannot entertain any reasonable doubt of this, when we reflect, that the meaning of external signs is not hid even from infants: an infant is remarkably affected with the passions of its nurse expressed on her countenance; a smile cheers it, a frown makes it afraid: but fear cannot be without apprehending danger; and what danger can the infant apprehend, unless it be sensible that its nurse is angry? We must therefore admit, that a child can read anger in its nurse's face; of which it must be sensible intuitively, for it has no other mean of knowledge. We do not affirm, that these particulars are clearly apprehended by the child; for to produce clear and distinct perceptions, reflection and experience are requisite: but that even an infant, when afraid, must have some notion of its being in danger, is evident.

Elements of Criticism.

That we should be conscious intuitively of a passion from its external expressions, is conformable to the analogy of nature: the knowledge of that language is of too great importance to be left upon experience; because

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Passion. a foundation so uncertain and precarious, would prove a great obstacle to the formation of societies. Wisely therefore is it ordered, and agreeably to the system of Providence, that we should have nature for our instructor.

Such is the philosophy of Lord Kames, to which objections unanswerable may be made. It is part of the instinctive system of metaphysics, which his lordship has carried farther than all who wrote before him, and perhaps farther than all who have succeeded him in this department of science. That a child intuitively reads anger in its nurse's face, is so far from being true, that for some short time after birth it is not terrified by the most menacing gestures. It is indeed absolutely incapable of fear till it has suffered pain, (see INSTINCT); and could we constantly caress it with what is called an *angry look*, it would be cheered by that look, and frightened at a smile. It feels, however, the *effects* of anger, and is soon capable of observing the peculiarity of feature with which that passion is usually accompanied; and these two become in a short time so linked together in its tender mind, that the appearance of the one naturally suggests to it the reality of the other.

Should it be said that a loud and sudden noise startles a child immediately after birth, and that, therefore, the infant must be instinctively afraid, the fact may be admitted, without any necessity of admitting the inference. The nerves of an infant are commonly very irritable, and the strong impulse on the *auditory* nerves may agitate its whole frame, without inspiring it with the passion of fear. The loud noise is in all probability not the sign of approaching danger, but the immediate cause of real pain, from which the infant shrinks as it would from the prick of a pin or the scorching of a candle. But we have said enough in the article immediately preceding, and in others which are there quoted, to show how the passions may be formed by associations even in early infancy, and yet operate as if they were instinctive. This being the case, we shall through the remainder of this article suffer his lordship to speak his own language, without making any further remarks upon it. We are induced to do this for two reasons; of which the first is, that many of our readers will probably prefer his theory to ours; and the second is, that his conclusions respecting the signs and language of passion hold equally good from either theory.

We perfectly agree with him, that manifold and admirable are the purposes to which the external signs of passion are made subservient by the Author of our nature.

1. The signs of internal agitation displayed externally to every spectator, tend to fix the signification of many words. The only effectual means to ascertain the meaning of any doubtful word, is an appeal to the thing it represents: and hence the ambiguity of words expressive of things that are not objects of external sense; for in that case an appeal is denied. Passion, strictly speaking, is not an object of external sense: but its external signs are: and by means of these signs, passions may be appealed to with tolerable accuracy; thus the words that denote our passions, next to those that denote external objects, have the most distinct meaning. Words signifying internal action and the more delicate feelings, are less distinct. This defect, with regard to internal action, is what chiefly occasions the intricacy of logic: the terms of that science are far from being sufficiently ascertained, even after much care and labour bestowed by an eminent writer†; to whom, however, the world is greatly indebted, for removing a mountain of rubbish, and moulding the subject into a rational and correct form, the same defect is remarkable in criticism, which has for its object the more delicate feelings; the terms that denote these feelings being not more distinct than those of logic.

2. Society among individuals is greatly promoted by that universal language. Looks and gestures give direct access to the heart; and lead us to select, with tolerable accuracy, the persons who are worthy of our confidence. It is surprising how quickly, and for the most part how correctly, we judge of character from external appearance.

3. After social intercourse is commenced, these external signs, which diffuse through a whole assembly the feelings of each individual, contribute above all other means to improve the social affections. Language, no doubt, is the most comprehensive vehicle for communicating emotions: but in expedition, as well as in power of conviction, it falls short of the signs under consideration; the involuntary signs especially, which are incapable of deceit. Where the countenance, the tones, the gestures, the actions, join with the words in communicating emotions, these united have a force irresistible. Thus all the pleasant emotions of the human heart, with all the social and virtuous affections, are, by means of these external signs, not only perceived, but felt. By this admirable contrivance, conversation becomes that lively and animating amusement, without which life would at best be insipid: one joyful countenance spreads cheerfulness instantaneously through a multitude of spectators.

4. Dissocial passions, being hurtful by prompting violence and mischief, are noted by the most conspicuous external signs, in order to put us upon our guard: thus anger and revenge, especially when sudden, display themselves on the countenance in legible characters. The external signs, again, of every passion that threatens danger, raise in us the passion of fear: which frequently operating without reason or reflection, moves us by a sudden impulse to avoid the impending danger.

5. These external signs are remarkably subservient to morality. A painful passion, being accompanied with disagreeable external signs, must produce in every spectator a painful emotion: but then, if the passion be social, the emotion it produces is attractive, and connects the spectator with the person who suffers. Dissocial passions only are productive of repulsive emotions, involving the spectator's aversion, and frequently his indignation. This artful contrivance makes us cling to the virtuous, and abhor the wicked.

6. Of all the external signs of passion, those of affliction or distress are the most illustrious with respect to a final cause, and deservedly merit a place of distinction. They are illustrious by the singularity of their contrivance; and also by inspiring sympathy, a passion to which human society is indebted for its greatest blessing, that of providing relief for the distressed. A subject so interesting deserves a leisurely and attentive examination. The conformity of the nature of man to his external circumstance is in every particular wonderful: his nature makes him prone to society; and society is necessary to his wellbeing, because in a solitary state he is a helpless being.

† Locke.

being destitute of support, and in his distresses destitute of relief: but mental support, the shining attribute of society, is of too great moment to be left dependent upon cool reason; it is ordered more wisely, and with greater conformity to the analogy of nature, that it should be enforced even instinctively by the passion of sympathy. Here sympathy makes a capital figure; and contributes, more than any other means, to make life easy and comfortable. But however essential the sympathy of others may be to our well-being, one beforehand would not readily conceive how it could be raised by external signs of distress; for considering the analogy of nature, if these signs be agreeable, they must give birth to a pleasant emotion leading every beholder to be pleased with human woes: if disagreeable, as they undoubtedly are, ought they not naturally to repel the spectator from them, in order to be relieved from pain? Such would be the reasoning beforehand; and such would be the effect were man purely a selfish being. But the benevolence of our nature gives a very different direction to the painful passion of sympathy, and to the desire involved in it: instead of avoiding distress, we fly to it in order to afford relief; and our sympathy cannot be otherwise gratified but by giving all the succour in our power. Thus external signs of distress, though disagreeable, are attractive; and the sympathy they inspire is a powerful cause, impelling us to afford relief even to a stranger, as if he were our friend or relation.

It is a noted observation, that the deepest tragedies are the most crowded; which in an overly view will be thought an unaccountable bias in human nature. Love of novelty, desire of occupation, beauty of action, make us fond of theatrical representations; and when once engaged, we must follow the story to the conclusion, whatever distress it may create. But we generally become wise by experience, and when we foresee what pain we shall suffer during the course of the representation, is it not surprising that persons of reflection do not avoid such spectacles altogether? And yet one who has scarce recovered from the distress of a deep tragedy, resolves coolly and deliberately to go to the very next, without the slightest obstruction from self-love. The whole mystery is explained by a single observation: That sympathy, though painful, is attractive; and attaches us to an object in distress, instead of prompting us to fly from it. And by this curious mechanism it is, that persons of any degree of sensibility are attracted by affliction still more than by joy.

To conclude: the external signs of passion are a strong indication, that man, by his very constitution, is framed to be open and sincere. A child, in all things obedient to the impulses of nature, hides none of its emotions; the savage and clown, who have no guide but pure nature, expose their hearts to view, by giving way to all the natural signs. And even when men learn to dissemble their sentiments, and when behaviour degenerates into art, there still remain checks, that keep dissimulation within bounds, and prevent a great part of its mischievous effects: the total suppression of the voluntary signs during any vivid passion, begets the utmost uneasiness, which cannot be endured for any considerable time: this operation becomes indeed less painful by habit; but luckily the involuntary signs cannot, by any effort, be suppressed or even dissembled. An absolute hypocrisy, by which the character is concealed and a fictitious one assumed, is made impracticable; and nature has thereby prevented much harm to society. We may pronounce, therefore, that Nature, herself sincere and candid, intends that mankind should preserve the same character, by cultivating simplicity and truth, and banishing every sort of dissimulation that tends to mischief.

Influence of PASSION *with respect to our Perceptions, Opinions, and Belief.* So intimately are our perceptions, passions, and actions, connected, it would be wonderful if they should have no mutual influence. That our actions are too much influenced by passion, is a known truth; but it is not less certain, though not so well known, that passion hath also an influence upon our perceptions, opinions, and belief. For example, the opinions we form of men and things are generally directed by affection: An advice given by a man of figure has great weight; the same advice from one in a low condition is despised or neglected: a man of courage underrates danger; and to the indolent the slightest obstacle appears unsurmountable. All this may be accounted for by the simple principle of association.

There is no truth more universally known, than that tranquillity and sedateness are the proper state of mind for accurate perception and cool deliberation; and for that reason, we never regard the opinion even of the wisest man, when we discover prejudice or passion behind the curtain. Passion hath such influence over us, as to give a false light to all its objects. Agreeable passions prepossess the mind in favour of their objects; and disagreeable passions, not less against their objects: A woman is all perfection in her lover's opinion, while in the eye of a rival beauty she is awkward and disagreeable: when the passion of love is gone, beauty vanishes with it;—nothing is left of that genteel motion, that sprightly conversation, those numberless graces, which formerly, in the lover's opinion, charmed all hearts. To a zealot every one of his own sect is a saint, while the most upright of a different sect are to him children of perdition: the talent of speaking in a friend, is more regarded than prudent conduct in any other. Nor will this surprise any one acquainted with the world; our opinions, the result frequently of various and complicated views, are commonly so slight and wavering, as readily to be susceptible of a bias from passion.

With that natural bias another circumstance concurs, to give passion an undue influence on our opinions and belief; and that is a strong tendency in our nature to justify our passions as well as our actions, not to others only, but even to ourselves. That tendency is peculiarly remarkable with respect to disagreeable passions: by its influence, objects are magnified or lessened, circumstances supplied or suppressed, every thing coloured and disguised to answer the end of justification. Hence the foundation of self-deceit, where a man imposes upon himself innocently, and even without suspicion of a bias.

We proceed to illustrate the foregoing observations by proper examples.

Gratitude, when warm, is often exerted upon the children of the benefactor; especially where he is removed out of reach by death or absence. The passion in this case being exerted for the sake of the benefactor, requires no peculiar excellence in his children: but the practice of doing good to these children produces an af-

Passion. tion for them, which never fails to advance them in our esteem. By such means, strong connections of affection are often formed among individuals, upon the slight foundation now mentioned.

Envy is a passion, which, being altogether unjustifiable, cannot be excused but by disguising it under some plausible name. At the same time, no passion is more eager than envy to give its object a disagreeable appearance: it magnifies every bad quality, and fixes on the most humiliating circumstances:

Cassius. I cannot tell what you and other men
Think of this life; but for my single self,
I had as lief not be, as live to be
In awe of such a thing as I myself.
I was born free as Cæsar, so were you;
We both have fed as well, and we can both
Endure the winter's cold as well as he.
For once, upon a raw and gusty day,
The troubled Tyber chafing with his shores,
Cæsar says to me, Dar'st thou, Cassius, now
Leap in with me into this angry flood,
And swim to yonder point?—Upon the word,
Accoutred as I was, I plunged in,
And bid him follow; so indeed he did.
The torrent roar'd, and we did buffet it
With lusty sinews; throwing it aside,
And stemming it with hearts of controversy.
But ere we could arrive the point propos'd,
Cæsar cry'd, Help me, Cassius, or I sink.
I, as Æneas, our great ancestor,
Did from the flames of Troy upon his shoulder
The old Anchises bear; so from the waves of Tyber
Did I the tired Cæsar: and this man
Is now become a god; and Cassius is
A wretched creature, and must bend his body
If Cæsar carelessly but nod on him.
He had a fever when he was in Spain;
And when the fit was on him, I did mark
How he did shake. 'Tis true, this god did shake
His coward lips did from their colour fly;
And that same eye whose bend doth awe the world
Did lose its lustre: I did hear him groan;
Ay, and that tongue of his, that bade the Romans
Mark him, and write his speeches in their books,
Alas! it cry'd—Give me some drink, Titinius,—
As a sick girl. Ye Gods, it doth amaze me,
A man of such a feeble temper should
So get the start of the majestic world,
And bear the palm alone. *Julius Cæsar*, act. ii. sc. 3.

Glo'ster, inflamed with resentment against his son Edgar, could even force himself into a momentary conviction that they were not related:

O strange fasten'd villain!
Would he deny his letter?—I never got him.
King Lear, act ii. sc. 3.

When by great sensibility of heart, or other means, grief becomes immoderate, the mind, in order to justify itself, is prone to magnify the cause; and if the real cause admit not of being magnified, the mind seeks a cause for its grief in imagined future events: Passion.

Busby. Madam, your majesty is much too sad:
You promis'd, when you parted with the king,
To lay aside self-harming heaviness,
And entertain a cheerful disposition.

Queen. To please the king, I did; to please myself,
I cannot do it. Yet I know no cause
Why I should welcome such a guest as grief;
Save bidding farewell to so sweet a guest
As my sweet Richard: yet again, methinks,
Some unborn sorrow, ripe in Fortune's womb,
Is coming tow'rd me; and my inward soul
With something trembles, yet at nothing grieves,
More than with parting from my lord the king.
Richard II. act ii. sc. 5.

Resentment at first is vented on the relations of the offender, in order to punish him; but as resentment, when so outrageous, is contrary to conscience, the mind, to justify its passion, is disposed to paint these relations in the blackest colours; and it comes at last to be convinced, that they ought to be punished for their own demerits.

Anger, raised by an accidental stroke upon a tender part of the body, is sometimes vented upon the undesigning cause. But as the passion in that case is absurd, and as there can be no solid gratification in punishing the innocent, the mind, prone to justify as well as to gratify its passion, deludes itself into a conviction of the action's being voluntary. The conviction, however, is but momentary; the first reflection shows it to be erroneous: and the passion vanisheth almost instantaneously with the conviction. But anger, the most violent of all passions, has still greater influence: it sometimes forces the mind to personify a stock or a stone if it happen to occasion bodily pain, and even to believe it a voluntary agent, in order to be a proper object of resentment. And that we have really a momentary conviction of its being a voluntary agent, must be evident from considering, that without such conviction the passion can neither be justified nor gratified: the imagination can give no aid; for a stock or a stone imagined insensible, cannot be an object of punishment, if the mind be conscious that it is an imagination merely without any reality (A). Of such personification, involving a conviction of reality, there is one illustrious instance. When the first bridge of boats over the Hellespont was destroyed by a storm, Xerxes fell into a transport of rage, so excessive, that he commanded the sea to be punished with 300 stripes; and a pair of fetters to be thrown into it, enjoining the following words to be pronounced: "O thou salt and bitter water! thy master hath condemned thee to this punishment for offending him without cause; and is resolved

(A) We have already shown how a man may be instigated to wreak his vengeance on a stock or a stone, without ever considering whether it be sensible or insensible: (See Passion). If the story of Xerxes be true, he may have considered the sea as sensible and animated, without dreaming that a stock or a stone is so. The sea was a god among many of the pagans, and was considered as such by Xerxes, otherwise he could not have apparded men for not sacrificing to it.

Passion. resolved to pass over thee in despite of thy insolence: with reason all men neglect to sacrifice to thee, because thou art both disagreeable and treacherous."

Shakespeare exhibits beautiful examples of the irregular influence of passion in making us believe things to be otherwise than they are. King Lear, in his distress, personifies the rain, wind, and thunder; and in order to justify his resentment, believes them to be taking part with his daughters:

Lear. Rumble thy bellyful, spit fire, spout rain!
Nor rain, wind, thunder, fire, are my daughters.
I tax not you, ye elements, with unkindness;
I never gave you kingdoms, call'd you children;
You owe me no subscription. Then let fall
Your horrible pleasure.—Here I stand, your brave;
A poor, infirm, weak, and despised old man!
But yet I call you servile ministers,
That have with two pernicious daughters join'd
Your high-engender'd battles 'gainst a head
So old and white as this. Oh! oh! 'tis foul!

Act iii. sc. 2.

King Richard, full of indignation against his favourite horse for carrying Bolingbroke, is led into the conviction of his being rational:

Groom. O, how it yearn'd my heart, when I beheld
In London streets, that coronation-day,
When Bolingbroke rode on Roan Barbary,
That horse that thou so often hast bestrid,
That horse that I so carefully have dressed.
K. Rich. Rode he on Barbary? tell me, gentle friend,
How went he under him?
Groom. So proudly as he had disdain'd the ground.
K. Rich. So proud that Bolingbroke was on his back!
That jade had eat bread from my royal hand.
This hand hath made him proud with clapping him.
Would he not stumble? would he not fall down,
(Since pride must have a fall), and break the neck
Of that proud man that did usurp his back?

Richard II. act v. sc. 11.

Hamlet, swelled with indignation at his mother's second marriage, was strongly inclined to lessen the time of her widowhood, the shortness of the time being a violent circumstance against her; and he deludes himself by degrees into the opinion of an interval shorter than the real one:

Hamlet. ———— ————That it should come to this!
But two months dead! nay, not so much; not two—
So excellent a king, that was, to this,
Hyperion to a satyr: so loving to my mother,
That he permitted not the wind of heav'n
Visit her face too roughly. Heav'n and earth!
Must I remember—why, she would hang on him,
As if increase of appetite had grown
By what it fed on: yet, within a month———
Let me not think—Frailty, thy name is *Woman*!
A little month! or ere those shoes were old,
With which she follow'd my poor father's body,
Like Niobe, all tears——why she, ev'n she—
(O heav'n! a beast, that wants discourse of reason,
Wou'd have mourn'd longer) married with mine uncle,
My father's brother; but no more like my father
Than I to Hercules. Within a month!—
Ere yet the salt of most unrighteous tears
Had left the flushing in her galled eyes,
She married——Oh, most wicked speed! to post
With such dexterity to incestuous sheets!
It is not, nor it cannot, come to good.
But break, my heart, for I must hold my tongue.

Act i. sc. 3.

The power of passion to falsify the computation of time is remarkable in this instance; because time, having an accurate measure, is less obsequious to our desires and wishes, than objects which have no precise standard of magnitude.

Good news are greedily swallowed upon very slender evidence; our wishes magnify the probability of the event, as well as the veracity of the relater; and we believe as certain what at best is doubtful:

Quel, che l'huom vede, amor li fa invisible
E l' invisibil fa veder amore.
Questo credute fu, che 'l miser suole
Dar facile credenza a' quel, che vuole.

Orland. Furios. cant. 1st. 56.

For the same reason, bad news gain also credit upon the slightest evidence: fear, if once alarmed, has the same effect with hope, to magnify every circumstance that tends to conviction. Shakespeare, who shows more knowledge of human nature than any of our philosophers, hath in his Cymbeline represented this bias of the mind; for he makes the person who alone was affected with the bad news, yield to evidence that did not convince any of his companions. And Othello is convinced of his wife's infidelity from circumstances too slight to move any person less interested.

If the news interest us in so low a degree as to give place to reason, the effect will not be altogether the same: judging of the probability or improbability of the story, the mind settles in a rational conviction either that it is true or not. But even in that case, the mind is not allowed to rest in that degree of conviction which is produced by rational evidence: if the news be in any degree favourable, our belief is raised by hope to an improper height; and if unfavourable, by fear.

This observation holds equally with respect to future events: if a future event be either much wished or dreaded, the mind never fails to augment the probability beyond truth.

That easiness of belief, with respect to wonders and prodigies, even the most absurd and ridiculous, is a strange phenomenon; because nothing can be more evident than the following proposition, That the more singular any event is, the more evidence is required to produce belief: a familiar event daily occurring, being in itself extremely probable, finds ready credit, and therefore is vouched by the slightest evidence; but to overcome the improbability of a strange and rare event, contrary to the course of nature, the very strongest evidence is required. It is certain, however, that wonders and prodigies are swallowed by the vulgar, upon evidence that would not be sufficient to ascertain the most familiar occurrence. It has been reckoned difficult to explain that irregular bias of mind; but we are now made acquainted with the influence of passion upon opinion and belief; a story of ghosts or fairies, told

 [w]ith

Paſſion.

with an air of gravity and truth, raiſeth an emotion of wonder, and perhaps of dread; and theſe emotions impoſing on a weak mind, impreſs upon it a thorough conviction contrary to reaſon.

Opinion and belief are influenced by propenſity as well as by paſſion. An innate propenſity is all we have to convince us that the operations of nature are uniform: influenced by that propenſity, we often raſhly think, that good or bad weather will never have an end; and in natural philoſophy, writers, influenced by the ſame propenſity, ſtretch commonly their analogical reaſonings beyond juſt bounds. See METAPHYSICS, N° 133, 134.

Opinion and belief are influenced by affection as well as by propenſity. The noted ſtory of a fine lady and a curate viewing the moon through a teleſcope is a pleaſant illuſtration: "I perceive (ſays the lady) two ſhadows inclining to each other; they are certainly two happy lovers:" "Not at all (replies the curate), they are two ſteeples of a cathedral."

Language of PASSION. Among the particulars that compoſe the ſocial part of our nature, a propenſity to communicate our opinions, our emotions, and every thing that affects us, is remarkable. Bad fortune and injuſtice affect us greatly; and of theſe we are ſo prone to complain, that if we have no friend or acquaintance to take part in our ſufferings, we ſometimes utter our complaints aloud, even where there are none to liſten.

But this propenſity operates not in every ſtate of mind. A man immoderately grieved, ſeeks to afflict himſelf, rejecting all conſolation: immoderate grief accordingly is mute; complaining is ſtruggling for conſolation.

It is the wretch's comfort ſtill to have
Some ſmall reſerve of near and inward wo,
Some unſuſpected hoard of inward grief,
Which they unſeen may wail, and weep, and mourn,
And glutton-like alone devour.

Mourning Bride, act i. ſc. 1.

When grief ſubſides, it then, and no ſooner, finds a tongue: we complain, becauſe complaining is an effort to diſburden the mind of its diſtreſs. This obſervation is finely illuſtrated by a ſtory which Herodotus records, book iii. Cambyſes, when he conquered Egypt, made Pſammeticus the king priſoner; and for trying his conſtancy, ordered his daughter to be dreſſed in the habit of a ſlave, and to be employed in bringing water from the river; his ſon alſo was led to execution with a halter about his neck. The Egyptians vented their ſorrow in tears and lamentations: Pſammeticus only, with a downcaſt eye, remained ſilent. Afterward meeting one of his companions, a man advanced in years, who, being plundered of all, was begging alms, he wept bitterly, calling him by his name. Cambyſes, ſtruck with wonder, demanded an anſwer to the following queſtion: "Pſammeticus, thy maſter Cambyſes is deſirous to know, why, after thou hadſt ſeen thy daughter ſo ignominiouſly treated, and thy ſon led to execution, without exclaiming or weeping, thou ſhouldſt be ſo highly concerned for a poor man noway related to thee?" Pſammeticus returned the following anſwer: "Son of Cyrus, the calamities of my family are too great to leave me the power of weeping; but the misfortunes of a companion, reduced in his old age to want of bread, is a fit ſubject for lamentation."

2

Paſſion.

Surpriſe and terror are ſilent paſſions, for a different reaſon: they agitate the mind ſo violently, as for a time to ſuſpend the exerciſe of its faculties, and among others the faculty of ſpeech.

Love and revenge, when immoderate, are not more loquacious than immoderate grief. But when theſe paſſions become moderate, they ſet the tongue free, and, like moderate grief, become loquacious. Moderate love, when unſucceſsful, is vented in complaints; when ſucceſsful, is full of joy expreſſed by words and geſtures.

As no paſſion hath any long uninterrupted exiſtence, nor beats always with an equal pulſe, the language ſuggeſted by paſſion is not only unequal but frequently interrupted; and even during an uninterrupted fit of paſſion, we only expreſs in words the more capital ſentiments. In familiar converſation, one who vents every ſingle thought, is juſtly branded with the character of *loquacity*; becauſe ſenſible people expreſs no thoughts but what make ſome figure: in the ſame manner, we are only diſpoſed to expreſs the ſtrongeſt impulſes of paſſion, eſpecially when it returns with impetuoſity after interruption.

It is elſewhere obſerved * that the ſentiments ought to be tuned to the paſſion, and the language to both. Elevated ſentiments require elevated language: tender ſentiments ought to be clothed in words that are ſoft and flowing: when the mind is depreſſed with any paſſion, the ſentiments muſt be expreſſed in words that are humble, not low. Words being intimately connected with the ideas they repreſent, the greateſt harmony is required between them: to expreſs, for example, an humble ſentiment in high-ſounding words, is diſagreeable by a diſcordant mixture of feelings; and the diſcord is not leſs when elevated ſentiments are dreſſed in low words:

* See the article *Sentiments*.

Verſibus exponi tragicis res comica non vult.
Indignatur item privatis ac prope ſocco
Dignis carminibus narrari cœna Thyeſtæ.

HORAT. *Ars Poet.* l. 89.

This, however, excludes not figurative expreſſion, which, within moderate bounds, communicates to the ſentiment an agreeable elevation. We are ſenſible of an effect directly oppoſite, where figurative expreſſion is indulged beyond a juſt meaſure: the oppoſition between the expreſſion and the ſentiment makes the diſcord appear greater than it is in reality.

At the ſame time, figures are not equally the language of every paſſion: pleaſant emotions, which elevate or ſwell the mind, vent themſelves in ſtrong epithets and figurative expreſſion; but humbling and diſpiriting paſſions affect to ſpeak plain:

Et tragicus plerumque dolet ſermone pedeſtri.
Telephus et Peleus, cum pauper et exul uterque,
Projicit ampullas et ſeſquipedalia verba,
Si curat cor ſpectantis tetigiſſe querela.

HORAT. *Ars Poet.* 95.

Figurative expreſſion, being the work of an enlivened imagination, cannot be the language of anguiſh or diſtreſs. Otway, ſenſible of this, has painted a ſcene of diſtreſs in colours finely adapted to the ſubject: there is

ſcarcely

Passion.

scarcely a figure in it, except a short and natural simile with which the speech is introduced. Belvidera, talking to her father of her husband:

Think you saw what past at our last parting;
Think you beheld him like a raging lion,
Pacing the earth, and tearing up his steps,
Fate in his eyes, and roaring with the pain
Of burning fury; think you saw his one hand
Fix'd on my throat, while the extended other
Grasp'd a keen threat'ning dagger: oh, 'twas thus
We last embrac'd, when, trembling with revenge,
He dragg'd me to the ground, and at my bosom
Presented horrid death; cry'd out, My friends!
Where are my friends? swore, wept, rag'd, threaten'd, lov'd;
For he yet lov'd, and that dear love preserv'd me
To this last trial of a father's pity.
I fear not death, but cannot bear a thought
That that dear hand should do th' unfriendly office.
If I was ever then your care, now hear me;
Fly to the senate, save the promis'd lives
Of his dear friends, ere mine be made the sacrifice.
Venice Preserv'd, Act v.

To preserve the foresaid resemblance between words and their meaning, the sentiments of active and hurrying passions ought to be dressed in words where syllables prevail that are pronounced short or fast; for these make an impression of hurry and precipitation. Emotions, on the other hand, that rest upon their objects, are best expressed by words where syllables prevail that are pronounced long or slow. A person affected with melancholy, has a languid and slow train of perceptions. The expression best suited to that state of mind, is where words, not only of long, but of many syllables, abound in the composition; and for that reason, nothing can be finer than the following passage:

In those deep solitudes, and awful cells,
Where heav'nly-pensive Contemplation dwells,
And ever-musing Melancholy reigns.
Pope, *Eloisa to Abelard*.

To preserve the same resemblance, another circumstance is requisite, that the language, like the emotion, be rough or smooth, broken or uniform. Calm and sweet emotions are best expressed by words that glide softly: surprise, fear, and other turbulent passions, require an expression both rough and broken.

It cannot have escaped any diligent inquirer into nature, that, in the hurry of passion, one generally expresses that thing first which is most at heart; which is beautifully done in the following passage:

Me, Me; adsum qui feci: in me convertite ferrum,
O Rutuli, mea fraus omnis. *Æneid*, ix. 427.

Passion has often the effect of redoubling words, the better to make them express the strong conception of the mind. This is finely imitated in the following examples.

——————Thou sun, said I, fair light!
And thou enlighten'd earth, so fresh and gay!
Ye hills and dales, ye rivers, woods, and plains!
And ye that live, and move, fair creatures! tell,
Tell, if ye saw, how came I thus, how here.—
Paradise Lost, viii. 273.

Passion.

——————Both have sinn'd! but thou
Against God only; I, 'gainst God and thee;
And to the place of judgment will return;
There with my cries importune Heav'n, that all
The sentence, from thy head remov'd, may light
On me, sole cause to thee of all this wo;
Me! me! only just object of his ire.
Paradise Lost, x. 930.

In general, the language of violent passion ought to be broken and interrupted. Soliloquies ought to be so in a peculiar manner: language is intended by nature for society; and a man when alone, though he always clothes his thoughts in words, seldom gives his words utterance, unless when prompted by some strong emotion; and even then by starts and intervals only. Shakespeare's soliloquies may be justly established as a model; for it is not easy to conceive any model more perfect. Of his many incomparable soliloquies, the two following only shall be quoted, being different in their manner.

Hamlet. Oh, that this too, too solid flesh would melt,
Thaw, and resolve itself into a dew!
Or that the Everlasting had not fix'd
His canon 'gainst self-slaughter! O God! O God!
How weary, stale, flat, and unprofitable,
Seem to me all the uses of this world!
Fie on't! O fie! 'tis an unweeded garden,
That grows to seed: things rank and gross in nature
Possess it merely.——That it should come to this!
But two months dead! nay, not so much; not two—
So excellent a king, that was, to this,
Hyperion to a satyr: so loving to my mother,
That he permitted not the winds of heav'n
Visit her face too roughly. Heav'n and earth!
Must I remember—why, she would hang on him,
As if increase of appetite had grown
By what it fed on: yet, within a month——
Let me not think—Frailty, thy name is *Woman!*
A little month! or ere those shoes were old,
With which she follow'd my poor father's body,
Like Niobe, all tears——why she, ev'n she——
(O heav'n! a beast, that wants discourse of reason,
Would have mourn'd longer—) married with mine uncle,
My father's brother; but no more like my father
Than I to Hercules. Within a month!——
Ere yet the salt of most unrighteous tears
Had left the flushing in her galled eyes,
She married——Oh, most wicked speed, to post
With such dexterity to incestuous sheets!
It is not, nor it cannot come to good.
But break, my heart, for I must hold my tongue.
Hamlet, Act i. sc. 3.

" *Ford.* Hum! ha! is this a vision? is this a dream?
" do I sleep? Mr Ford, awake; awake, Mr Ford;
" there's a hole made in your best coat, Mr Ford! this
" 'tis to be married! this 'tis to have linen and buck
" baskets! Well, I will proclaim myself what I am;
" I

Passion. "I will now take the leacher; he is at my house; "he cannot 'scape me; 'tis impossible he should; he "cannot creep into a halfpenny purse, nor into a pep-"per-box. But lest the devil that guides him should "aid him, I will search impossible places; tho' what I "am I cannot avoid, yet to be what I would not, shall "not make me tame."

Merry Wives of Windsor, act iii. sc. last.

These soliloquies are accurate and bold copies of nature: in a passionate soliloquy one begins with thinking aloud, and the strongest feelings only are expressed; as the speaker warms, he begins to imagine one listening, and gradually slides into a connected discourse.

How far distant are soliloquies generally from these models? So far indeed as to give disgust instead of pleasure. The first scene of Iphigenia in Tauris discovers that princess, in a soliloquy, gravely reporting to herself her own history. There is the same impropriety in the first scene of Alcestes, and in the other introductions of Euripides, almost without exception. Nothing can be more ridiculous; it puts one in mind of a most curious device in Gothic paintings, that of making every figure explain itself by a written label issuing from its mouth. The description which a parasite, in the Eunuch of Terence (act ii. sc. 2.) gives of himself, makes a sprightly soliloquy: but it is not consistent with the rules of propriety; for no man, in his ordinary state of mind and upon a familiar subject, ever thinks of talking aloud to himself. The same objection lies against a soliloquy in the Adelphi of the same author (act i. sc. 1.). The soliloquy which makes the third scene, act third of his *Hecyra*, is insufferable; for there Pamphilus, soberly and circumstantially, relates to himself an adventure which had happened to him a moment before.

Corneille is unhappy in his soliloquies: Take for a specimen the first scene of Cinna.

Racine is extremely faulty in the same respect. His soliloquies are regular harangues, a chain completed in every link, without interruption or interval: that of Antiochus in Berenice (act i. sc. 2.), resembles a regular pleading, where the parties *pro* and *con* display their arguments at full length. The following soliloquies are equally faulty: *Bajazet*, act iii. sc. 7.; *Mithridate*, act iii. sc. 4. and act iv. sc. 5.; *Iphigenia*, act iv. sc. 8.

Soliloquies upon lively or interesting subjects, but without any turbulence of passion, may be carried on in a continued chain of thought. If, for example, the nature and sprightliness of the subject prompt a man to speak his thoughts in the form of a dialogue, the expression must be carried on without break or interruption, as in a dialogue between two persons; which justifies Falstaff's soliloquy upon honour:

"What need I be so forward with Death, that calls "not on me? Well, 'tis no matter, Honour pricks me "on. But how if Honour prick me off, when I come "on? how then? Can honour set a leg? No. Or an "arm? No. Or take away the grief of an wound? "No. Honour hath no skill in surgery then? No. "What is Honour? A word.—What is that word *ho-"nour*? Air; a trim reckoning.—Who hath it? He "that dy'd a Wednesday. Doth he feel it? No. "Doth he hear it? No. Is it insensible then? Yea, "to the dead. But will it not live with the living? Passion. "No. Why? Detraction will not suffer it. Therefore "I'll none of it; honour is a mere scutcheon: and so "ends my catechism."

First Part, Henry IV. act v. sc. 2.

And even without dialogue a continued discourse may be justified, where a man reasons in a soliloquy upon an important subject; for if in such a case it be at all excusable to think aloud, it is necessary that the reasoning be carried on in a chain; which justifies that admirable soliloquy in *Hamlet* upon life and immortality, being a serene meditation upon the most interesting of all subjects. And the same consideration will justify the soliloquy that introduces the 5th act of Addison's *Cato*.

Language ought not to be elevated above the tone of the sentiment.

Zara. Swift as occasion I
Myself will fly; and earlier than the morn
Wake thee to freedom. Now 'tis late; and yet
Some news few minutes past arriv'd, which seem'd
To shake the temper of the king——Who knows
What racking cares disease a monarch's bed?
Or love, that late at night still lights his lamp,
And strikes his rays through dusk, and folded lids,
Forbidding rest, may stretch his eyes awake,
And force their balls abroad at this dead hour.
I'll try. *Mourning Bride*, act iii. sc. 4.

The language here is undoubtedly too pompous and laboured for describing so simple a circumstance as absence of sleep. In the following passage, the tone of the language, warm and plaintive, is well suited to the passion, which is recent grief: but every one will be sensible, that in the last couplet save one the tone is changed, and the mind suddenly elevated to be let fall as suddenly in the last couplet:

Il déteste à jamais sa coupable victoire,
Il renonce à la cour, aux humains, à la gloir
Et se fuiant lui-même, au milieu des deserts,
Il va cacher sa peine au bout de l'univers;
Là, soit que le soleil rendît le jour au monde,
Soit qu'il finît sa course au vaste sein de l'onde,
Sa voix faisoit redire aux echos attendris,
Le nom, le triste nom, de son malheureux fils.

Henriade, chant. viii. 229.

Light and airy language is unsuitable to a severe passion.

Imagery and figurative expression are discordant, in the highest degree, with the agony of a mother, who is deprived of two hopeful sons by a brutal murder. Therefore the following passage is undoubtedly in a bad taste:

Queen. Ah, my poor princes! ah, my tender babes?
My unblown flowers, new appearing sweets?
If yet your gentle souls fly in the air,
And be not fixt in doom perpetual,
Hover about me with your airy wings,
And hear your mother's lamentation.

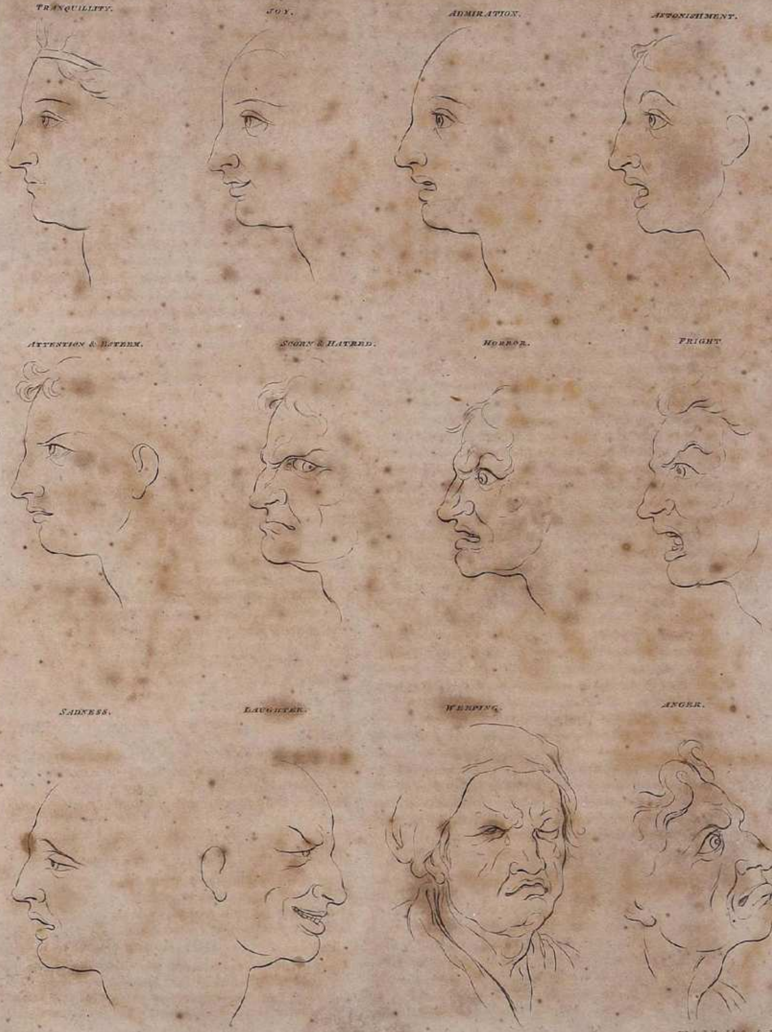
Richard III. act iv. sc. 4.

Again:

K. Philip. You are as fond of grief as of your child.
Constance. Grief fills the room up of my absent child,

Lies,

PASSIONS. *PLATE CCCCV.*



PASSIONS. *PLATE CCCCVI.*

ANGER MIXED with FEAR.

EXTREME DESPAIR.

LOVE.

HUMILITY.

DESIRE.

RAPTURE.

FEAR.

DISDAIN.

TERROR.

COMPASSION.

JEALOUSY.

ACUTE DISTRESS of BODY & MIND.

W. Archibald Sculp.t

Passion. Lies in his bed, walks up and down with me,
Puts on his pretty looks, repeats his words,
Remembers me of all his gracious parts,
Stuffs out his vacant garment with his form;
Then have I reason to be fond of grief.

K. John, act iii. sc. 9.

Thoughts that turn upon the expression instead of the subject, commonly called *a play of words*, being low and childish, are unworthy of any composition, whether gay or serious, that pretends to any degree of elevation.

In the *Amynta* of Tasso, the lover falls into a mere play of words, demanding how he who had lost himself, could find a mistress. And for the same reason, the following passage in Corneille has been generally condemned:

Chimene. Mon pere est mort, Elvire, et la premiere épée
Dont s'est armée Rodrigue a sa trame coupée.
Pleurez, pleurez, mes yeux, et fondez-vous en eaux,
La moietié de ma vie a mis l'autre au tombeau,
Et m'oblige à venger, après ce coup funeste,
Celle que je n'ai plus, sur celle que me reste.

Cid, act iii. sc. 3.

To die is to be banish'd from myself:
And Sylvia is myself: banish'd from her,
Is self from self; a deadly banishment!

Two Gentlemen of Verona, act iii. sc. 3.

Countess. I pray thee, Lady, have a better cheer:
If thou engrossest all the griefs as thine,
Thou robb'st me of a moiety.

All's well that ends well, act iii. sc. 3.

K. Henry. O my poor kingdom, sick with civil blows!
When that my care could not withhold thy riots,
What wilt thou do when riot is thy care?
O, thou wilt be a wilderness again,
Peopled with wolves, thy old inhabitants.

Second Part, Henry IV. act iv. sc. 11.

Cruda Amarilli, che col nome ancora
D'amar, ahi lasso, amaramente insegni.

Pastor Fido, act i. sc. 2.

Antony, speaking of Julius Cæsar:

O world! thou wast the forest of this hart;
And this, indeed, O world, the heart of thee.
How like a deer, stricken by many princes,
Dost thou here lie! *Julius Cæsar*, act iii. sc. 5.

Playing thus with the sound of words, which is still worse than a pun, is the meanest of all conceits. But Shakespeare, when he descends to a play of words, is not always in the wrong; for it is done sometimes to denote a peculiar character, as in the following passage:

K. Philip. What say'st thou, boy? look in the lady's face.
Lewis. I do, my Lord, and in her eye I find
A wonder, or a wond'rous miracle;
The shadow of myself form'd in her eye;
Which being but the shadow of your son,
Becomes a son, and makes your son a shadow.
I do protest, I never lov'd myself
Till now infixed I beheld myself
Drawn in the flatt'ring table of her eye.
Faulconbridge. Drawn in the flatt'ring table of her eye!
Hang'd in the frowning wrinkle of her brow!
And quarter'd in her heart! he doth espy
Himself Love's traitor: this is pity now,
That hang'd, and drawn, and quarter'd there should be,
In such a love so vile a lout as he.

King John, act ii. sc. 5.

A jingle of words is the lowest species of that low wit, which is scarcely sufferable in any case, and least of all in an heroic poem: and yet Milton in some instances has descended to that puerility:

And brought into the world a world of wo.
——Begirth th' Almighty throne
Beseeching or besieging——
Which tempted our attempt——
At one flight bound high overleap'd all bound.
————————With a shout
Loud as from numbers without number.

One should think it unnecessary to enter a caveat against an expression that has no meaning, or no distinct meaning; and yet somewhat of that kind may be found even among good writers.

Sebastian. I beg no pity for this mould'ring clay.
For if you give it burial, there it takes
Possession of your earth:
If burnt and scatter'd in the air; the winds
That strow my dust, diffuse my royalty,
And spread me o'er your clime; for where one atom
Of mine shall light, know there Sebastian reigns.

DRYDEN, *Don Sebastian King of Portugal*, act i.

Cleopatra. Now, what news, my Charmion?
Will he be kind? and will he not forsake me?
Am I to live or die? nay, do I live?
Or am I dead? for when he gave his answer,
Fate took the word, and then I liv'd or dy'd.

DRYDEN, *All for Love*, act ii.

If she be coy, and scorn my noble fire,
If her chill heart I cannot move;
Why, I'll enjoy the very love,
And make a mistress of my own desire.

COWLEY, *poem inscribed* "The Request."

His whole poem inscribed *My Picture* is a jargon of the same kind.

————'Tis he, they cry, by whom
Not men, but war itself is overcome.

Indian Queen.

Such empty expressions are finely ridiculed in the *Rehearsal.*

Was't not unjust to ravish hence her breath,
And in life's stead to leave us nought but death?

Act iv. sc. 1.

PASSIONS, in *Medicine*, make one of the non-naturals, and produce very sensible effects. Joy, anger, and fear, are the principal. In the two first, the spirits are hurried with too great vivacity; whereas, in fear or dread,

Passion. dread, they are as it were curbed and concentrated: whence we may conclude, that they have a very bad effect upon health; and therefore it will be best to keep them within bounds as much as possible, and to preserve an inward serenity, calmness, and tranquillity.

Passions, in *Painting*, are the external expressions of the different dispositions and affections of the mind; but particularly their different effects upon the several features of the face: for though the arms, and indeed every part of the body *, serve likewise, by their quick, languid, and variously diversified motions, to express the passions of the soul; yet, in painting, this difference is most conspicuous in the face. See Painting, and Drawing, § 8.

* See *Oratory*, N° 20. 37.

As we have given engravings of Le Brun's drawings of the passions, we shall here subjoin the account which he has given of each of these heads.

Plates CCCCV, and CCCCVI. 1. The effects of *attention* are, to make the eyebrows sink and approach the sides of the nose; to turn the eyeballs toward the object that causes it; to open the mouth, and especially the upper part; to decline the head a little, and fix it without any other remarkable alteration.

2. *Admiration* causes but little agitation in the mind, and therefore alters but very little the parts of the face; nevertheless the eyebrow rises; the eye opens a little more than ordinary; the eyeball placed equally between the eyelids appears fixed on the object; the mouth half opens, and makes no sensible alteration in the cheeks.

3. The motions that accompany *admiration with astonishment* are hardly different from those of simple admiration, only they are more lively and stronger marked; the eyebrows more elevated; the eyes more open; the eyeball further from the lower eyelid, and more steadily fixed: The mouth is more open, and all the parts in a much stronger emotion.

4. Admiration begets esteem, and this produces *veneration*, which, when it has for its object something divine or beyond our comprehension, makes the face decline, and the eyebrows bend down; the eyes are almost shut and fixed: the mouth is shut. These motions are gentle, and produce but little alteration in the other parts.

5. Although *rapture* has the same object as veneration, only considered in a different manner, its motions are not the same; the head inclines to the left side; the eyeballs and eyebrows rise directly up; the mouth half opens, and the two corners are also a little turned up: the other parts remain in their natural state.

6. The passion of *desire* brings the eyebrows close together and forwards toward the eyes, which are more open than ordinary: the eyeball is inflamed, and places itself in the middle of the eye; the nostrils rise up, and are contracted towards the eyes; the mouth half opens, and the spirits being in motion give a lively glowing colour.

7. Very little alteration is remarked in the face of those that feel within themselves the *sweetness of joy*, or *joy with tranquillity*. The forehead is serene; the eyebrow without motion, elevated in the middle; the eye pretty open and with a laughing air; the eyeball lively and shining; the corners of the mouth turn up a little; the complexion is lively; the cheeks and lips are red.

8. *Laughter*, which is produced by joy mixed with surprise, makes the eyebrow rise towards the middle of the eye, and bend towards the sides of the nose; the eyes are almost shut, and sometimes appear wet, or shed tears, which make no alteration in the face; the mouth half open, shows the teeth; the corners of the mouth drawn back, cause a wrinkle in the cheeks, which appear so swelled as to hide the eyes in some measure; the nostrils are open, and all the face is of a red colour. Passion.

9. *Acute pain* makes the eyebrows approach one another, and rise towards the middle; the eyeball is hid under the eyebrows; the nostrils rise and make a wrinkle in the cheeks; the mouth half opens and draws back: all the parts of the face are agitated in proportion to the violence of the pain.

10. *Simple bodily pain* produces proportionally the same motions as the last, but not so strong: The eyebrows do not approach and rise so much; the eyeball appears fixed on some object; the nostrils rise, but the wrinkles in the cheeks are less perceivable; the lips are further asunder towards the middle, and the mouth is half open.

11. The dejection that is produced by *sadness* makes the eyebrows rise towards the middle of the forehead more than towards the cheeks; the eyeball appears full of perturbation; the white of the eye is yellow; the eyelids are drawn down, and a little swelled; all about the eyes is livid; the nostrils are drawn downward; the mouth is half open, and the corners are drawn down; the head carelessly leaning on one of the shoulders: the face is of a lead colour; the lips pale.

12. The alterations that *weeping* occasions are strongly marked: The eyebrows sink down towards the middle of the forehead; the eyes are almost closed, wet, and drawn down towards the cheeks; the nostrils swelled; the muscles and veins of the forehead appear; the mouth is shut, and the sides of it are drawn down, making wrinkles on the cheeks; the under lip pushed out, presses the upper one: all the face is wrinkled and contracted; its colour is red, especially about the eyebrows, the eyes, the nose, and the cheeks.

13. The lively attention to the misfortunes of another, which is called *compassion*, causes the eyebrows to sink towards the middle of the forehead; the eyeball to be fixed upon the object; the sides of the nostrils next the nose to be a little elevated, making wrinkles in the cheeks; the mouth to be open; the upper lip to be lifted up and thrust forwards; the muscles and all the parts of the face sinking down and turning towards the object which excites the passion.

14. The motions of *scorn* are lively and strong: The forehead is wrinkled; the eyebrow is knit; the side of it next the nose sinks down, and the other side rises very much; the eye is very open, and the eyeball is in the middle; the nostrils rise, and draw towards the eyes, and make wrinkles in the cheeks; the mouth shuts, its sides sinking down, and the under-lip is pushed out beyond the upper one.

15. An object despised sometimes causes *horror*, and then the eyebrow knits, and sinks a great deal more. The eyeball, placed at the bottom of the eye, is half covered by the lower eyelid; the mouth is half open, but closer in the middle than the sides, which being drawn back;

back, makes wrinkles in the cheeks; the face grows pale, and the eyes become livid; the muſcles and the veins are marked.

16. The violence of *terror or fright*, alters all the parts of the face; the eyebrow riſes in the middle; its muſcles are marked, ſwelled, preſſed one againſt the other, and ſunk towards the noſe, which draws up as well as the noſtrils; the eyes are very open; the upper eyelid is hid under the eyebrow; the white of the eye is encompaſſed with red; the eyeball fixes toward the lower part of the eye; the lower part of the eyelid ſwells and becomes livid; the muſcles of the noſe and cheeks ſwell, and theſe laſt terminate in a point toward the ſides of the noſtrils; the mouth is very open, and its corners very apparent; the muſcles and veins of the neck ſtretched; the hair ſtands on end; the colour of the face, that is, the end of the noſe, the lips, the ears, and round the eyes, is pale and livid; and all ought to be ſtrongly marked.

17. The effects of *anger* ſhow its nature. The eyes become red and inflamed; the eyeball is ſtaring and ſparkling; the eyebrows are ſometimes elevated and ſometimes ſunk down equally: the forehead is very much wrinkled, with wrinkles between the eyes; the noſtrils are open and enlarged: the lips preſſing againſt one another, the under one riſing over the upper one leaves the corners of the mouth a little open, making a cruel and diſdainful grin.

18. *Hatred or jealouſy* wrinkles the forehead; the eyebrows are ſunk down and knit; the eyeball is half hid under the eyebrows, which turn towards the object; it ſhould appear full of fire, as well as the white of the eye and the eyelid; the noſtrils are pale, open, more marked than ordinary, and drawn backward ſo as to make wrinkles in the cheeks; the mouth is ſo ſhut as to ſhow the teeth are cloſed; the corners of the mouth are drawn back and very much ſunk; the muſcles of the jaw appear ſunk; the colour of the face is partly inflamed and partly yellowiſh; the lips pale or livid.

19. As *deſpair* is extreme, its motions are ſo likewiſe; the forehead wrinkles from the top to the bottom; the eyebrows bend down over the eyes, and preſs one another on the ſides of the noſe; the eye ſeems to be on fire, and full of blood; the eyeball is diſturbed, hid under the eyebrow, ſparkling and unfixed; the eyelid is ſwelled and livid; the noſtrils are large, open, and lifted up; the end of the noſe ſinks down; the muſcles, tendons, and veins, are ſwelled and ſtretched; the upper part of the cheeks is large, marked, and narrow towards the jaw; the mouth drawn backwards is more open at the ſides than in the middle; the lower lip is large and turned out; they gnaſh their teeth; they foam; they bite their lips, which are pale; as in the reſt of the face; the hair is ſtraight and ſtands on end.

PASSION-Flower. See PASSIFLORA, BOTANY *Index*.

PASSION-Week, the week immediately preceding the feſtival of Eaſter; ſo called, becauſe in that week our Saviour's paſſion and death happened. The Thurſday of this week is called *Maunday Thurſday;* the Friday, *Good Friday;* and the Saturday, the *Great Sabbath*.

PASSIVE, in general, denotes ſomething that ſuffers the action of another, called an *agent* or *active power*. In grammar, the verb or word that expreſſes this paſſion is termed a *paſſive verb:* which, in the learned languages, has a peculiar termination; as *amor*, *doceor*, &c. in Latin; that is an *r* is added to the actives, *amo*, *doceo:* and, in the Greek, the inflection is made by changing ω into ομαι; as τυπτω, τυπτομαι, &c. But in the modern languages, the paſſive inflection is performed by means of auxiliary verbs, joined to the participle of the paſt tenſe; as, "I am praiſed," in Latin *laudor*, and in Greek ἐπαινεομαι; or, "I am loved," in Latin *amor*, and in Greek φιλεομαι. Thus it appears that the auxiliary verb *am*, ſerves to form the paſſives of Engliſh verbs: and the ſame holds of the French; as, *Je ſuis loué*, "I am praiſed;" *J'ai eté loué*, "I have been praiſed," &c. See GRAMMAR.

PASSIVE Title, in *Scots Law*. See LAW, Part III. Nº clxxx. 30.

PASSIVE Obedience, a political doctrine which has been much miſrepreſented, and is, of courſe, very obnoxious to the friends of freedom. Some nonjurors, in the end of the laſt and in the beginning of the paſſing century, imagining that monarchy is the only lawful form of government, and that hereditary monarchy is the only lawful ſpecies of that government, have coupled with paſſive obedience the ridiculous notion of a divine, hereditary, indefeaſible right of certain families to govern with deſpotic ſway all other families of the ſame nation. The abſurdity of this notion needs not to be dwelt upon; but it may not be improper, to obſerve, that it has nothing to do with paſſive obedience.

As taught by the ableſt reaſoners, who think that they are ſupported by the holy ſcripture, paſſive obedience is as much a duty under republican as under monarchical governments; and it means no more, but that private individuals are bound by the moſt ſolemn moral ties not to reſiſt the ſupreme power whereſoever placed in any nation. The ſupreme power can only be the legiſlature; and no man or body of men, who have not the power of enacting and abrogating laws can, on this principle, claim paſſive obedience from any ſubject. Whether the principle be well or ill founded, the abſurdity which commonly attaches to the phraſe *paſſive obedience*, originates from the miſtaken loyalty of the adherents of the houſe of Stuart, who to aggravate the illegality of the revolution, were wont to repreſent James II. as ſupreme over both houſes of parliament, and of courſe over all law. That ſuch reveries were fooliſh, we need no farther evidence than the ſtatute-book, which ſhows, that in the office of legiſlation, the king, lords, and commons, are co-ordinate; and that when any one of theſe powers ſhall take upon itſelf to counteract the other two, the duty of paſſive obedience will oblige the ſubject to ſupport the legiſlature. That reſiſtance to the legiſlature, if lawful on any occaſion, can be ſo only to oppoſe the moſt violent tyranny, has been ſhown by Mr Hume with great cogency of argument, and is indeed a propoſition ſelf-evident. That it can never be lawful on any occaſion, Biſhop Berkeley endeavoured to prove by a chain of reaſoning which it would be difficult to break. We enter not into the controverſy, but refer our readers to Hume's Eſſays and Berkeley's Paſſive Obedience and Nonreſiſtance, or, as it was intitled by a late editor, The Meaſure of Submiſſion to Civil Government. We ſhall only obſerve, that there is a great difference between *active*

active and *passive* obedience; and that many who conſider themſelves as bound on *no account* whatever to *reſiſt* the ſupreme power, would yet *ſuffer death* rather than do an immoral action in obedience to any law of earthly origin.

PASSIVE Prayer, among the *mystic divines*, is a total ſuſpenſion or ligature of the intellectual faculties; in virtue whereof, the ſoul remains of itſelf, and as to its own power, impotent with regard to the producing of any effects. The paſſive ſtate, according to Fenelon, is only paſſive in the ſame ſenſe as contemplation is, *i. e.* it does not exclude peaceable, diſintereſted acts, but only unquiet ones, or ſuch as tend to our own intereſt. In the paſſive ſtate, the ſoul has not properly any activity, and ſenſation, of its own: it is a mere infinite flexibility of the ſoul, to which the feebleſt impulſe of grace gives motion.

PASSOVER, a ſolemn feſtival of the Jews, inſtituted in commemoration of their coming out of Egypt; becauſe the night before their departure, the deſtroying angel, who put to death the firſt-born of the Egyptians, paſſed over the houſes of the Hebrews without entering therein, becauſe they were marked with the blood of the lamb which was killed the evening before, and which for this reaſon was called the *paſchal lamb*. This feaſt was called *paſcha* by the old Greeks and Romans; not we preſume from πασχω, "I ſuffer," as Chryſoſtom, Irenæus, and Tertullian, ſuppoſe, but from the Hebrew word *peſah, paſſage, leap*. The following is what God ordained concerning the paſſover of the Jews, (Exod. xii.). The month of the coming forth from Egypt was looked upon from this time to be the firſt month of the ſacred or eccleſiaſtical year, and the fourteenth day of this month, between the two veſpers, that is, between the ſun's decline and his ſetting: or rather, according to our manner of reckoning, between two o'clock in the afternoon and ſix o'clock in the evening at the equinox, they were to kill the paſchal lamb, and to abſtain from leavened bread. The day following being the fifteenth, counting from ſix o'clock of the foregoing evening, which concluded the fourteenth, was the grand feaſt of the paſſover, which continued ſeven days. But it was only the firſt and the ſeventh day that were ſolemn. The lamb that was killed ought to be without any defect, a male, and yeaned that year. If no lamb could be found, they might take a kid. They killed a lamb or a kid in every family; and if the number of thoſe that lived in the houſe was not ſufficient to eat a lamb, they might join two houſes together. With the blood of the paſchal lamb they ſprinkled the door-poſts and lintel of every houſe, that the deſtroying angel, at the ſight of the blood, might paſs over them, and ſave the Hebrew children. They were to eat the lamb the ſame night that followed the ſacrifice; they ate it roaſted, with unleavened bread, and a ſalad of wild lettuce. The Hebrew ſays literally, with bitter things, as ſuppoſe muſtard, or any thing of this nature to give a reliſh. It was forbid to eat any part of it raw, or boiled in water, nor were they to break a bone, (Exod. vii. 46. Numb. ix. 12. John xix. 36.); and if any thing remained to the day following, it was thrown into the fire. They that ate it were to be in the poſture of travellers, having their reins girt, their ſhoes on their feet, their ſtaves in their hands, and eating in a hurry. But this laſt part of the ceremony was but little obſerved, at leaſt it was of no obligation, but only upon that night they came forth out of Egypt. For the whole eight days of the paſſover no leavened bread was to be uſed; and whoever ſhould eat any, was threatened to be cut off from his people. With regard to the ceremonies which are obſerved in relation to the bread, ſee the article BREAD.

They keep the firſt and laſt day of the feaſt, yet ſo as that it was allowed to dreſs victuals, which was forbidden on the Sabbath-day. The obligation of keeping the paſſover was ſo ſtrict, that whoever ſhould neglect to do it, was condemned to death, (Numb. ix. 13.). But thoſe who had any lawful impediment, as a journey, ſickneſs, or any uncleanneſs, voluntary or involuntary; for example, thoſe that had been preſent at a funeral, or by any other accident had been defiled, were to defer the celebration of the paſſover till the ſecond month of the eccleſiaſtical year, or to the fourteenth day of the month Jair, which anſwers to April and May. It was thus the Lord ordered Moſes, upon the occaſion of the inquiry of ſome Iſraelites, who had been obliged to pay their laſt offices to ſome of their relations, and who being thus polluted, were not capable of partaking of the paſchal ſacrifice, (2 Chr. xxx. 1, 2, &c.). The modern Jews obſerve in general the ſame ceremonies that were practiſed by their anceſtors, in the celebration of the paſſover. On the fourteenth of Niſan, the firſt-born faſt in memory of God's ſmiting the firſt-born of the Egyptians. The morning prayers are the ſame with thoſe ſaid on other feſtivals. They take the roll of the pentateuch out of the cheſt, and read as far as the end of the twelfth chapter of Exodus, and what is contained in the eighteenth chapter of Numbers, relating to the paſſover. The matron of the family then ſpreads a table, and ſets on it two unleavened cakes, and two pieces of the lamb, a ſhoulder boiled and another roaſted, to put them in mind that God delivered them with a ſtretched-out arm. To this they add ſome ſmall fiſhes, becauſe of the leviathan; a hard egg, becauſe of the ziz; ſome meal, becauſe of the behemoth, (theſe three animals being appointed for the feaſt of the elect in the other life); and peas and nuts for the children, to provoke their curioſity to aſk the reaſon of this ceremony. They likewiſe uſe a kind of muſtard, which has the appearance of mortar, to repreſent their making bricks in Egypt. The father of the family ſits down with his children and ſlaves, becauſe on this day all are free. Being ſet down, he takes bitter herbs, and dips them in the muſtard, then eats them, and diſtributes to the reſt. Then they eat of the lamb, the hiſtory and inſtitution of which is at that time recited by the maſter of the family. The whole repaſt is attended with hymns and prayers. They pray for the prince under whoſe dominion they live, according to the advice of Jeremiah (xxix. 7.), "Seek the peace of the city whither I have cauſed you to be carried away captives, and pray unto the Lord for it: for in the peace thereof ſhall ye have peace." See the article FEAST, &c. The ſame things are put in practice the two following days; and the feſtival is concluded by the ceremony *habdala* or diſtinction. This ceremony is performed at the cloſing of the Sabbath-day, at which time the maſter of the houſe pronounces certain benedictions, accompanied with certain formalities, requeſting that every thing may ſucceed well the week following. After going out of the ſynagogue, they

they then eat leavened bread for the last time. (Leo of Modena, p. iii. c. 3. and the Rabbins). While the temple was standing, they brought their lambs thither, and sacrificed them, offering the blood to the priest, who poured it out at the foot of the altar. The passover was typically predictive of Christ our Christian passover, (1 Cor. v. 7.). As the destroying angel passed over the houses marked with the blood of the paschal lamb, so the wrath of God passes over them whose souls are sprinkled with the blood of Christ. The paschal lamb was killed before Israel was delivered, so it is necessary Christ should suffer before we could be redeemed. It was killed before Moses's law or Aaron's sacrifices were enjoined, to show that deliverance comes to mankind by none of them; but only the true passover, that Lamb of God slain from the foundation of the world, (Rom. iii. 25. Heb. ix. 14.). It was killed the first month of the year, which prefigured that Christ should suffer death in this month, (John xviii. 28.). It was killed in the evening, (Exod. xii. 6.). So Christ suffered in the last days, and at this time of the day, (Matt. xxvii. 46. Heb. i. 2.). At even also the sun sets, which shows that it was the Sun of Righteousness who was to suffer and die, and that at his passion universal darkness should be upon the whole earth, (Luke xxiii. 44.). The passover was roasted with fire, to denote the sharp and dreadful pains which Christ should suffer, not only from men, but from God also. It was to be eaten with bitter herbs, not only to put them in remembrance of their bitter bondage in Egypt, but also to typify our mortification to sin, and readiness to undergo afflictions for Christ, (Col. i. 24.). Many erroneously imagine, that the passover was instituted in memory of the Israelites passing the Red Sea; though it is certain the feast was held, and had its name, before the Israelites took a step of their way out of Egypt, and consequently several days before their passing the Red Sea. Besides the passover celebrated on the fourteenth of the first month, there was a second passover held on the fourteenth of the second month after the equinox, instituted by God in favour of travellers and sick persons, who could not attend at the first, nor be at Jerusalem on the day. The Greeks, and even some of the catholic doctors, from the thirteenth, eighteenth, and nineteenth, chapters, of St John, take occasion to conclude, that Jesus anticipated the day marked for the passover in the law; but the authority of three evangelists seems to evince the contrary. See Whitby's Dissertation on this subject, in an appendix to the fourteenth chapter of St Mark. F. Lamy supposes, that our Lord did not attend at the passover the last year of his life; which sentiment has drawn upon him abundance of opposers. F. Hardouin asserts, that the Galileans celebrated the passover on one day, and the Jews on another.

PASSPORT, or Pass, a licence or writing obtained from a prince or governor, granting permission and a safe conduct to pass through his territories without molestation: Also a permission granted by any state to navigate in some particular sea, without hinderance or molestation from it. It contains the name of the vessel, and that of the master, together with her tonnage and the number of her crew, certifying that she belongs to the subjects of a particular state, and requiring all persons at peace with that state to suffer her to proceed on her voyage without interruption.

The violation of safe-conducts or passports expressly granted by the king or by his ambassadors to the subjects of a foreign power in time of mutual war, or committing acts of hostility against such as are in amity, league, or truce with us, who are here under a general implied safe-conduct, are breaches of the public faith, without which there can be no intercourse or commerce between one nation and another; and such offences may, according to the writers upon the law of nations, be a proper ground of a national war. And it is enacted by the statute 31 Hen. VI. cap. 4. still in force, that if any of the king's subjects attempt to offend upon the sea, or in any port within the king's obeysance, or against any stranger in amity, league, or truce, or under safe-conduct, and especially by attacking his person, or spoiling him, or robbing him of his goods; the lord-chancellor, with any of the justices of either the king's-bench or common-pleas, may cause full restitution and amends to be made to the party injured. Pasquier says that *passport* was introduced for *passe par-tout*. Balzac mentions a very honourable passport given by an emperor to a philosopher in these terms: "If there be any one on land or sea hardy enough to molest Potamon, let him consider whether he be strong enough to wage war with Cæsar."

Passport is used likewise for a licence granted by a prince for the importing or exporting merchandizes, moveables, &c. without paying the duties. Merchants procure such passports for certain kinds of commodities: and they are always given to ambassadors and ministers for their baggage, equipage, &c.

Passport is also a licence obtained for the importing or exporting of merchandizes deemed contraband, and declared such by tariffs, &c. as gold, silver, precious stones, ammunition of war, horses, corn, wool, &c. upon paying duties.

PASSUS, among the Romans, a measure of length, being about four feet ten inches, or the thousandth part of a Roman mile. The word properly signifies, the space betwixt the feet of a man walking at an ordinary rate. See Measure.

PASTE, in *Cookery*, a soft composition of flour, wrought up with proper fluids, as water, milk, or the like, to serve for cases or coffins, therein to bake meats, fruits, &c. It is the basis or foundation of pyes, tarts, patties, pasties, and other works of pastry. It is also used in confectionary, &c. for a preparation of some fruit, made by beating the pulp thereof with some fluid or other admixture, into a soft pappy consistence, spreading it into a dish, and drying it with sugar, till it becomes as pliable as an ordinary paste. It is used occasionally also for making the crusts and bottoms of pyes, &c. Thus, with proper admixtures, are made almond pastes, apple pastes, apricot pastes, cherry, currant, lemon, plum, peach, and pear pastes.

Paste is likewise used for a preparation of wheaten flour, boiled up and incorporated with water; used by various artificers, as upholsterers, saddlers, bookbinders, &c. instead of glue or size, to fasten or cement their cloths, leathers, papers, &c. When paste is used by bookbinders, or for paper-hangings to rooms, they mix a fourth, fifth, or sixth, of the weight of the flour of powdered resin; and where it is wanted still more tenacious, gum arabic or any kind of size may be added. Paste may be preserved, by dissolving a little sublimate, in

in the proportion of a dram to a quart, in the water employed for making it, which will prevent not only rats and mice, but any other kind of vermin and inſects, from preying upon it.

PASTES, in the glaſs trade, or the imitation or counterfeiting of gems in glaſs; ſee GEM.

PASTEBOARD, a kind of thick paper, formed of ſeveral ſingle ſheets paſted one upon another. The chief uſe of paſteboard is for binding books, making letter-caſes, &c. See PAPER.

PASTERN *of a* HORSE, in the manege, is the diſtance betwixt the joint next the foot and the coronet of the hoof. This part ſhould be ſhort, eſpecially in middle-ſized horſes; becauſe long paſterns are weak, and cannot ſo well endure travelling.

PASTERN Joint, the joint next a horſe's foot.

PASTIL, or PASTEL, among painters, a kind of paſte made of different colours ground up with gum-water, in order to make CRAYONS.

PASTIL, in *Pharmacy*, is a dry compoſition of ſweet-ſmelling reſins, aromatic woods, &c. ſometimes burnt to clear and ſcent the air of a chamber.

PASTIME, a ſport, amuſement, or diverſion. Paſtimes of ſome kind ſeem to be abſolutely neceſſary, and to none more than to the man of ſtudy; for the moſt vigorous mind cannot bear to be always bent. Conſtant application to one purſuit, if it deeply engage the attention, is apt to unhinge the mind, and to generate madneſs; of which the Don Quixote of Cervantes, and the aſtronomer of Johnſon, are two admirably conceived inſtances. But though paſtime is neceſſary to relieve the mind, it indicates great frivolity when made the buſineſs of life; and yet the rich and the great, who are not obliged to labour for the means of ſubſiſtence, too often rove from paſtime to paſtime with as conſtant aſſiduity as the mechanic toils for his family, or as the philoſopher devotes himſelf to the cultivation of ſcience. When thoſe paſtimes tend to give elaſticity to the mind or ſtrength to the body, ſuch conduct is not only allowable, but praiſe-worthy; but when they produce effects the reverſe of theſe, it is both hurtful and criminal. The gaming-table, the maſquerade, the midnight aſſembly of any ſort, muſt of neceſſity enfeeble both the body and the mind; and yet ſuch are the faſhionable amuſements of the preſent day, to which many a belle and many a beau ſacrifice their beauty, their health, their quiet, and their virtue.

Far different were the paſtimes of our wiſer anceſtors: Remote from vice and effeminacy, they were innocent, manly, and generous exerciſes. From the ancient records of this country, it appears, that the ſports, amuſements, pleaſures, and recreations, of our anceſtors, as deſcribed by Fitz-Stephen (A), added ſtrength and agility to the wheels of ſtate mechaniſm, while they had a direct tendency towards utility. For moſt of theſe ancient recreations are reſolvable into the public defence of the ſtate againſt the attacks of a foreign enemy. The play at ball, derived from the Romans, is firſt introduced by this author as the common exerciſe of every ſchool-boy. The performance was in a field, where the reſort of the moſt ſubſtantial and conſiderable citizens, to give encouragement and countenance to this feat of agility, was ſplendid and numerous. The intention of this amuſement at this period of time was to make the juvenile race active, nimble, and vigorous; which qualities were requiſite whenever their aſſiſtance ſhould be wanted in the protection of their country. The next ſpecies of paſtime indeed does not ſeem to have this tendency; but it was only, as it ſeems, an annual cuſtom: This was cock-fighting. The author tells us, that in the afternoon of Shrove-Tueſday, on which day this cuſtom prevailed, they concluded the day in throwing the ball: which ſeems to inſinuate, that the cock-fighting was merely in conformity to ancient uſage, and limited only to part of the day, to make way for a more laudable performance. We may reaſonably ſuppoſe, although this author is entirely ſilent upon this head, that while cock-fighting was going on, cock-throwing was the ſport of the loweſt claſs of people, who could not afford the expence of the former (B). Another ſpecies of manly exerciſe was truly martial, and intended to qualify the adventurers for martial diſcipline. It is related by Fitz-Stephen thus: "Every Friday in Lent, a company of young men comes into the field on horſeback, attended and conducted by the beſt horſemen: then march forth the ſons of the citizens, and other young men, with diſarmed lances and ſhields; and there practiſe feats of war. Many courtiers likewiſe, when the king is near the ſpot, and attendants upon noblemen, do repair to theſe exerciſes; and while the hope of victory does inflame their minds, they ſhow by good proof how ſerviceable they would be in martial affairs." This evidently is of Roman deſcent, and immediately brings to our recollection the *Ludus Trojæ*, ſuppoſed to be the invention, as it was the common exerciſe, of Aſcanius. The common people, in this age of maſculine manners, made every amuſement where ſtrength was exerted the ſubject matter of inſtruction and improvement: inſtructed

(A) Otherwiſe called William Stephanides, a monk of Canterbury, who lived in the reign of King Stephen to the time of Richard I. He wrote a Latin treatiſe, in which he gives an account of the ſeveral paſtimes which were countenanced in his time. Bale in his writings draws a pleaſing portrait of him. He is likewiſe ſketched in ſtrong and forcible outlines of praiſe and commendation by Leland. Bale ſays thus of him: "The time which other people uſually miſemployed in an idle and frivolous manner, he conſecrated to inquiries which tended to increaſe the fame and dignity of his country: in doing which, he was not unworthy of being compared to Plato; for like him, he made the ſtudy of men and heaven his conſtant exerciſe."

(B) There were places ſet apart for the battles of theſe animals, as at this day, where no one was admitted without money. Theſe places, or *pits* commonly called, were ſchools, as at this day, in which people were inſtructed in the doctrines of chance, loſs and gain, betting and wagers, and particularly in the liberal art of *laying two to one*. Cock-throwing has been laudably aboliſhed; for it was a ſpecies of cruelty towards an innocent and uſeful animal; and ſuch a cruelty as would have kindled compaſſion in the heart of the rankeſt barbarian.

Pastime. instructed to exert their bodily strength in the maintenance of their country's rights; and their minds improved by such exertion, into every manly and generous principle.

In the vacant intervals of industry and labour, commonly called the holy-days, indolence and inactivity, which at this day mark this portion of time, were found only in those whose lives were distempered with age or infirmity. The view which Fitz-Stephen gives us of the Easter holydays is animated. "In Easter holydays they fight battles upon the water. A shield is hanged upon a pole, fixed in the middle of the stream. A boat is prepared without oars, to be borne along by the violence of the water; and in the forepart thereof standeth a young man, ready to give charge upon the shield with his lance. If so be that he break his lance against the shield, and doth not fall, he is thought to have performed a worthy deed. If without breaking his lance he runs strongly against the shield, down he falleth into the water; for the boat is violently forced with the tide: but on each side of the shield ride two boats, furnished with young men, who recover him who falleth soon as they may. In the holydays all the summer the youths are exercised in leaping, dancing, shooting, wrestling, casting the stone, and practising their shields; and the maidens trip with their timbrels, and dance as long as they can well see. In winter, every holyday before dinner, the boars prepared for brawn are set to fight, or else bulls or bears are baited."

These were the laudable pursuits to which leisure was devoted by our forefathers, so far back as the year 1130. Their immediate successors breathed the same generous spirit. In the year 1222, the sixth year of Henry III. we find, that certain masters in exercises of this kind made a public profession of their instructions and discipline, which they imparted to those who were desirous of attaining excellence and victory in these honourable atchievements. About this period, the persons of better rank and family introduced the play of *Tennis* (C); and erected courts or oblong edifices for the performance of the exercise.

About the year 1253, in the 38th year of Henry III. the *Quintan* was a sport much in fashion in almost every part of the kingdom. This contrivance consisted of an upright post firmly fixed in the ground, upon the top of which was a cross piece of wood, moveable upon a spindle; one end of which was broad like the flat part of a halberd, while at the other end was hung a bag of sand. The exercise was performed on horseback. The masterly performance was, when, upon the broad part being struck with a lance, which sometimes broke it, the assailant rode swiftly on, so as to avoid being struck on the back by the bag of sand, which turned round instantly upon the stroke given with a very swift motion. He who executed this feat in the most dexterous manner was declared victor, and the prize to which he became intitled was a peacock. But if, upon the aim taken, the contender miscarried in striking at the broadside, his impotency of skill became the ridicule and contempt of the spectators. Pastime.

Dr Plott, in his Natural History of Oxfordshire, tells us, that this pastime was in practice in his time at Deddington in this county. "They first (says this author) fixed a post perpendicularly in the ground, and then placed a small piece of timber upon the top of it, fastened on a spindle, with a board nailed to it on one end, and a bag of sand hanging at the other. Against this board they anciently rode with spears: now as I saw it at Deddington only with strong staves, which violently bringing about the bag of sand, if they make not good speed away, it strikes them in the neck or shoulders, and sometimes perhaps strikes them down from their horses; the great design of the sport being to try the agility both of man and horse, and to break the board; which, whoever did, was accounted conqueror: for whom heretofore there was some reward always appointed." (D)

Matthew Paris, speaking of this manly diversion, says, "The London youths made trial of their strength on horseback, by running at the *Quintan*; in doing which, whoever excelled all the rest was rewarded with a peacock." This sport is continued to this day in Wales; and being in use only upon marriages, it may be considered as a votive pastime, by which these heroic spirits seem to wish, that the male issue of such marriage may be as strong, vigorous, and active, as those who are at that time engaged in the celebration of this festive exertion of manhood. Virtuous exercises of this kind would

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(C) The word *Tennis* seems to owe its original to the French language: if so, the game is of French production. Yet the word *tenez* will hardly be found to afford incontrovertible evidence upon this subject. For the holding or keeping possession of the ball is no part of the game, but rather a circumstance casually attending it: since, during the performance of it the ball is in continual motion, so there can be no *tenez* at this juncture. Perhaps a place in France called *Tennois* (as there is a town which differs only in a letter, called *Sennois*, in the district of Champagne) was the place where the balls were first made, and the game first introduced.

(D) This was certainly an exercise derived from a military institution of the Romans, though not instrumentally the same. Whoever considers the form and disposition of the Roman camps, which were formed into a square figure, will find there were four principal gates or passages. Near the *Quæstorium*, or Quæstor's apartment, was the *Forum*, or what is now called a suttling-house, and from being near the Quæstor's station called *Quæstorium forum*. At this part was a fifth gate *Quintana*, where the soldiers were instructed in the discipline of the *Palaria*, which was to aim at and strike their javelins against an upright post fixed in the ground, as a kind of *prolusion* to a real engagement with an enemy. By the frequent practice of this exercise, sometimes called *exercitium ad palum* by Roman writers, the soldiers at length acquired not only a dexterity and address in the management of their arms, but a constant and regular exactness in the direction of them. *Titus Livius Patavinus*, cap. 2. *Pancirollus Rerum Memoral.* lib. ii. tit. 21. *Vulturius in Augustanis Monumentis*, lib. ii. p. 237.

Upon the irruption of the *Istri* into the Roman camps, which they plundered, says Livius, *ad Quæstorium forum, quintanamque pervenerunt.*

Pastime. would be too rude and barbarous for the attendants on pleasure in the present age. The hand would tremble at the weight of the javelin; and the heart would pant upon the apprehension of personal insecurity. While these exertions of triumphant prowess continued, the sordid degeneracy of disposition, the supple baseness of temper, were unknown: for the love of country, as the Roman orator has wisely observed, *included all other virtues*. But if we guard the palace of honour, like the brazen castle of Danaë, with every possible security, importunate corruption will be ever waiting at the gate, to seize an opportunity of intrusion. These feats of honourable contest were succeeded by the gilded banners of exhibition, and all the long train of dependents in the interest of indolence: for the writers of these times inform us, that the soft pleasures of the stage forced the passes to public favour in the year 1391, and likewise in the year 1409; so that utility, which before stood on the right hand of pleasure, was now ordered to withdraw for a season. The drama, it seems, was attempted by a set of useless and insignificant persons called *parish-clerks*; who, because they had the knowledge of the alphabet, ignorantly presumed that this included every other species of knowledge. The subject was truly serious, the creation of the world; but the performance must have been ludicrous. It was, however, honoured with the attendance of noble personages; and royalty itself deigned to cast a favourable eye upon it, for the king and queen were present. These interludes lasted no longer than the time requisite for the former confederacy of utility and pleasure to resume its powers; as when the pliable bow by being too much bent is put out of shape, and by its elasticity recovers its former position. The lance, the shield, the ball, and the equestrian procession, came forward again, and put the dramatic usurper to flight. After this period, these objects of generous pleasure seem to have had their audience of leave, and one general object, indeed no less manly than the former, to have filled their stations, which was archery. This had a continuance to the reign of Charles I. for we find in many hospitals founded in that reign among the articles of benefaction recorded upon their walls, this singular provision, *arms for the boys*, which signified *bows and arrows*.

There are many places at this day, formerly resorted to, for the practice of this noble art, distinguished by appellations which indicate their ancient usage: such as Brentford Butts, Newington Butts, and many others of the like denomination. It appears from 33 Hen. VIII. that by the intrusion of other pernicious games, archery had been for a long time disused; to revive which this statute was made. It seems that the bows of the best kind were made of yew; and that this wood might be readily obtained for this purpose, yew-trees were planted in churchyards. The sons of those only who were persons of fortune and fashion, if under 17 years of age, were permitted to use such bows. The words of the statute are singular, and ran thus: "No person under seventeen years, except he, or his father or mother, have lands or tenements to the yearly value of ten pounds, or be worth in value or moveables the sum of forty marks sterling, shall shoot with any bow of yew, which shall be bought for him, after the feast of our Lady next coming, under the pain to lose and forfeit six shillings and eightpence." Two observations arise here upon these words. One, that the yew-wood, not being so common as other wood, might probably be soon found deficient, as it was the best wood for making bows, if not restrained in the use of it to particular ages and persons, as young people wantonly destroy what is put into their hands for useful purposes. The other observation is, that the age of 17 is by this statute distinguished as the age of discretion, when young people are more attentive and considerate in things of private concern; an age in these times which few ever arrive at, and some never. This statute makes provision of other kinds of wood for the common people in the following manner: "To the intent that every person may have bows of mean price, be it enacted, that every bowyer shall, for every bow that he maketh of yew, make four other bows, meet to shoot with, of elm, witch hasill, ash, or other wood apt for the same, under pain to lose and forfeit for every such bow so lacking the sum of three shillings and fourpence." It seems there was a species of yew at this time called *elk*, which wood was stronger and more pliant than the common yew mentioned in this statute, and the price of it fixed. "Moreover, no bowyer shall sell or put to sale to any of the king's subjects, any bow of yew of the tax called *elk*, above the price of three shillings and fourpence, under the pain to forfeit twenty shillings for every bow sold above the said price." Pastime.

From these several considerations which occur in this statute, we can trace three resplendent qualities, courage, strength, and agility; which three united, inspired to more, generosity and magnanimity. Upon the decline of this and other polished (E) amusements, a savage deformity of manners sprung up, but spangled here and there with the opposite character of lazy opulence, which began now to erect her velvet standard in defiance of chaste and regular manners.

Towards the beginning of James I.'s reign, military prowess seems to have founded a retreat (F). He, to gratify the importunity of the common people, and at the

(E) How widely different the conceptions of politeness at this day from what they were in the most refined ages of Greece and Rome! These two states agreed in fixing the standard of this accomplishment upon the fitness and propriety of things. We bend to an arbitrary imposture of language, trusting to the sense and meaning of our opposite Gallic neighbours, as if this island was at all times to be the foot-ball of that continent. To define politeness in its ancient and true sense, it is a manly exertion of conduct, founded upon every noble and virtuous principle. Gallic politeness is an effeminate impotence of demeanor, founded upon fallacy, evasion, and every insidious artifice. There can be no security, no happiness, no prosperity, awaiting this kingdom, so long as we fawn to fashions that disgrace humanity, and to manners which consist of more than Punic perfidy.

(F) It has been confidently asserted by some historians, that James was, during his whole life, struck with terror upon the sight of a drawn sword; which was the reason of his great unwillingness in bestowing the honour of knighthood.

the ſame time to obviate his own fears upon a refuſal, publiſhed a book of ſports, in which the people had been ſome time before uſually indulged on Sunday evenings, but which had been lately prohibited. Theſe ſports conſiſted of dancing, ſinging, wreſtling, church ales, and other profanations of that day.

Charles, his ſucceſſor, wiſely, in the very entrance of his reign, aboliſhed theſe ſports. The act of Charles ſtates the ſeveral amuſements in part; by which we may conjecture what was the remainder as ſtated in the book of ſports by James. It is neceſſary to tranſcribe that part of the act relating to this ſubject. "Foraſmuch as there is nothing more acceptable to God, than the true and ſincere worſhip of Him, and ſervice according to His holy will, and that the holy keeping of the Lord's day is a principal part of the ſervice of God, which in many places of this realm hath been, and now is, prophaned and neglected by a diſorderly ſort of people, in exerciſing and frequenting bear-baiting, bull-baiting, interludes, and common-plays, and other unlawful exerciſes and paſtimes, neglecting divine ſervice both in their own pariſhes and elſewhere: Be it enacted, that from and after forty days next after the end of this ſeſſion of parliament, there ſhall be no meetings, aſſemblies, or concourſe of people, out of their own pariſhes, on the Lord's day, within this realm of England, or any the dominions thereof, for any ſports or paſtimes whatſoever: nor any bear-baiting, bull-baiting, interludes, common-plays, or other unlawful exerciſes or paſtimes, uſed by any perſon or perſons within their own pariſhes: and that every perſon and perſons offending in any of the ſaid premiſes, ſhall forfeit for every offence the ſum of three ſhillings and fourpence; the ſame to be employed and converted to the uſe of the poor of the pariſh where ſuch offence ſhall be committed." All this was perhaps proper, and ſhowed the diſtinguiſhed piety of this unfortunate monarch. But in this age likewiſe ended the manly ſports of Britons, and nothing was introduced that could compenſate for the loſs.

All theſe luſory arts, conſidered as vehicles of pleaſure, from the variety of their inventions, repreſent pleaſure as a fleeting phantom: evincing at the ſame time the ſtability of happineſs as ſpringing from internal order. Even reflex acts, pregnant with future hopes of ſolace and ſocial recreation, have more true feelings in expectancy than thoſe which ariſe from the object in poſſeſſion. Nay, pleaſure is found frequently in the imagination only: for Ixion's diſappointment frequently awaits us when we advance to embrace this Juno of our deſires.

Upon the whole, happineſs, the only thing of intrinſic value, muſt ariſe in the heart, and be ſomething more ſolid than what mere amuſement can poſſibly ſupply. Amuſements or paſtimes ought to be conſidered only as neceſſary relaxations from ſeverer and more uſeful employment; and in this point of view they may be ſolely purſued; but they become criminal when they occupy the place of the buſineſs of life.

PASTINACA, the PARSNEP, a genus of plants belonging to the pentandria claſs; and in the natural method ranking under the 45th order, *Umbellatæ*. See BOTANY *Index*.

PASTOPHORI, among the ancients, were prieſts whoſe office it was to carry the images, along with the ſhrines of the gods, at ſolemn feſtivals, when they were to pray to them for rain, fair weather, or the like. The Greeks had a college of this order of prieſts in Sylla's time. The cells or apartments near the temples, where the paſtophori lived, were called *paſtophoria*. There were ſeveral lodging rooms for the prieſts of a ſimilar kind in the temple of Jeruſalem.

PASTORAL, in general, ſomething that relates to ſhepherds: hence we ſay, paſtoral life, manners, poetry, &c.

Paſtoral life may be conſidered in three different views; either ſuch as it now actually is; when the ſtate of ſhepherds is reduced to be a mean, ſervile, and laborious ſtate; when their employments are become diſagreeable, and their ideas groſs and low: or ſuch as we may ſuppoſe it once to have been, in the more early and ſimple ages, when it was a life of eaſe and abundance; when the wealth of men conſiſted chiefly in flocks and herds, and the ſhepherd, though unrefined in his manners, was reſpectable in his ſtate: or, laſtly, ſuch as it never was, and never can in reality be, when, to the eaſe, innocence, and ſimplicity of the early ages, we attempt to add the poliſhed taſte, and cultivated manners of modern times. Of theſe three ſtates, the firſt is too groſs and mean, the laſt too refined and unnatural, to be made the groundwork of paſtoral poetry. Either of theſe extremes is a rock upon which the poet will ſplit, if he approach too near it. We will be diſguſted if he give us too much of the ſervile employments and low ideas of actual peaſants, as Theocritus is cenſured for having ſometimes done; and if, like ſome of the French and Italian writers of paſtorals, he make his ſhepherds diſcourſe as if they were courtiers and ſcholars, he then retains the name only, but wants the ſpirit of paſtoral poetry.

Blair's Lectures, vol. iii. p. 117.

PASTORAL Poetry. See POETRY, Part II. ſect. 4.

PASTRY, that branch of cookery which is chiefly taken up in making pies, paſties, cakes, &c. See PASTE.

Dr Cullen obſerves, that paſte is very hard and indigeſtible without butter; and even with it, is apt to produce heartburn and aceſcency. Perhaps this is increaſed by the burned butter, from a certain ſenſibility in the ſtomach, which occaſions all empyreumatic oils to be long retained, and ſo produce acidity.

PASTURE, or *PASTURE Land*, is that reſerved for feeding cattle. See AGRICULTURE *Index*.

PATÆCI, in *Mythology*, images of gods which the Phœnicians carried on the prows of their gallies. Herodotus, lib. iv. calls them πάταικοι. The word is Phœnician, and derived from *pethica*, i. e. *titulus*. See Bocchart's Chanaan, lib. ii. cap. 3. But Scaliger does not agree. Morin derives it from πίθηκος, *monkey*, this animal having been an object of worſhip among the Egyptians, and hence might have been honoured by their

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knighthood. For at this juncture, he had ſuch a tremor upon him, that inſtead of laying the ſword upon the ſhoulder of the perſon to be knighted, he frequently would be obſerved almoſt to thruſt the point of it into the face of the party: which occaſioned thoſe about him to aſſiſt him in the direction of his hand.

Patæci, Patagonia.

their neighbours. Mr Elfner has obferved, that Herodotus does not call the patæci *gods*; but that they obtained this dignity from the liberality of Hefychius and Suidas, and other ancient lexicographers, who place them at the ftern of fhips; whereas Herodotus placed them at the prow. Scaliger, Bochart, and Selden, have taken fome pains about this fubject.—M. Morin has alfo given us a learned differtation on this head in the *Memoires de l'Acad. des Infcript. et Belles Lettres*, tom. i.; but Mr Elfner thinks it defective in point of evidence.

PATAGONIA, a country of South America, comprehending all that country extending from Chili and Paraguay to the utmoft extremity of South America; that is, from 35° almoft to 54° of latitude: being furrounded by the countries juft mentioned, the South and North feas, and the ftraits of Magellan, which feparate it from the ifland called *Terra del Fuego*, and extend about 116 leagues in length from fea to fea, but only from half a league to three or four in breadth.

This country had the name of *Terra Magellanica*, from Ferdinand Magellan, a Portuguefe officer in the fervice of the Catholic king, who is reported to have failed through the ftraits that alfo bear his name, from the North to the South fea, in the year 1519.

The lofty mountains of the Andes, which are covered with fnow a great part of the year, traverfing the country from north to fouth, the air is faid to be much colder than in the north under the fame parallels of latitude. Towards the north, it is faid to be covered with wood, and ftored with an inexhauftible fund of large timber; whereas, to the fouthward, not fo much as a fingle tree fit for any mechanical purpofe is to be feen: yet there is good pafture, and incredible numbers of wild horned cattle and horfes, which were firft brought hither by the Spaniards, and have increafed amazingly. Frefh water, we are told by fome writers, is very fcarce; but if that were really the cafe, it is difficult to conceive how the prefent inhabitants and fuch multitudes of cattle could fubfift. The eaft coaft is moftly low land, with few or no good harbours: one of the beft is Port St Julian.

Patagonia is inhabited by a variety of Indian tribes; as the Patagons, from which the country takes its names; the Pampas, the Coffares, &c. of whom we know very little. Only it appears, from the accounts of former voyagers, lately confirmed by Commodore Byron and his crew, and the teftimonies of other navigators, that fome of them are of a gigantic ftature, and clothed with fkins; but it would feem that there are others who go almoft quite naked, notwithftanding the inclemency of the climate. Some of them alfo, that live about the ftraits, if we may credit the navigators who have paffed that way into the South fea, are perfect favages: but thofe with whom Commodore Byron and his people converfed, are reprefented as of a more gentle, humane difpofition; only, like other favages, they live on fifh and game, and the fpontaneous productions of the earth.

The Spaniards once built a fort upon the ftraits, and left a garrifon in it, to prevent any other European nation paffing that way into the South fea: but moft of the men perifhed by famine, whence the place obtained the name of *Port Famine;* and no people have attempted to plant colonies here ever fince.

Patagonia.

About the middle of the ftrait is a promontory called *Cape Froiford*, which is the moft foutherly on the continent of South America.

On the coafts of Patagonia lie a great number of iflands, or clufters of iflands. On the weft coafts are the iflands Madre de Dios, Santa Trinidad, Santa Cruz, the ifles of the Chunians and Huillans, the Sarmientos, and many others; to the number of 80 in all, as fome fay. Of thofe on the fouth coaft, the moft confiderable are *Terra del Fuego*, and *Staten Land*. See thefe articles.

A vaft deal has been faid refpecting the ftature of the Patagonians, by people of different nations, and on various occafions. We fhall infert the following letter from Mr Charles Clarke, who was on board Byron's fhip in 1764, and gave this account to Dr Maty.

"We had not got above 10 or 12 leagues into the ftraits of Magellan, from the Atlantic ocean, before we faw feveral people, fome on horfeback, fome on foot, upon the north fhore (continent), and with the help of our glaffes could perceive them beckoning to us to come on fhore, and at the fame time obferved to each other, that they feemed to be of an extraordinary fize: However, we continued to ftand on, and fhould have paffed without taking the leaft farther notice of them, could we have proceeded; but our breeze dying away, and the tide making againft us, we were obliged to anchor; when the commodore ordered his boat of 12 oars, and another of fix, to be hoifted out, manned, and armed. In the firft went the commodore, in the other Mr Cummins our firft lieutenant, and myfelf. At our firft leaving the fhip, their number did not exceed 40; but as we approached the fhore, we perceived them pouring down from all quarters, fome galloping, others running, all making ufe of their utmoft expedition. They collected themfelves into a body juft at the place we fteered off for. When we had got within 12 or 14 yards of the beach, we found it a difagreeable flat fhore, with very large ftones, which we apprehended would injure the boats; fo looked at two or three different places to find the moft convenient for landing. They fuppofed we deferred coming on fhore through apprehenfions of danger from them; upon which they all threw open the fkins which were over their fhoulders, which was the only clothing they had, and confequently the only thing they could fecret any kind of arms with, and many of them lay down clofe to the water's edge.—The commodore made a motion for them to go a little way from the water, that we might have room to land, which they immediately complied with, and withdrew 30 or 40 yards; we then landed, and formed each man with his mufket, in cafe any violence fhould be offered. As foon as we were formed, the commodore went from us to them, then at about 20 yards diftance: they feemed vaftly happy at his going among them, immediately gathered round him, and made a rude kind of noife, which I believe was their method of finging; as their countenances befpoke it a fpecies of jollity. The commodore then made a motion to them to fit down, which they did in a circle, with him in the middle, when Mr Byron took fome beads and ribbons, which he had brought for that purpofe, and tied about the women's necks, with which they feemed infinitely pleafed. We were ftruck with the greateft aftonifhment at the fight of people of fuch a gigantic ftature, notwithftanding our previous

Patagonia. previous notice with glaffes from the fhip. Their body was increafed, by the time we got in there, to the number of 500, men, women, and children. The men and women both rode in the fame manner; the women had a kind of belt to clofe their fkins round the waift, which the men had not, as theirs were only flung over their fhoulders, and tied with two little flips, cut from the fkin, round the neck. At the time of the commodore's motion for them to retire farther up the beach, they all difmounted, and turned their horfes loofe, which were gentle, and ftood very quietly. The commodore having difpofed of all his prefents, and fatisfied his curiofity, thought proper to retire; but they were vaftly anxious to have him go up into the country to eat with them. That they wanted him to go with them to eat, we could very well underftand by their motions, but their language was wholly unintelligible to us.—There was a very great fmoke to which they pointed about a mile from us, where there muft have been feveral fires; but fome intervening hills prevented our feeing any thing but the fmoke. The commodore returned the compliment, by inviting them on board the fhip; but they would not favour him with their company; fo we embarked, and returned to the fhip. We were with them near two hours at noon-day within a very few yards, though none had the honour of fhaking hands but Mr Byron and Mr Cummins; however, we were near enough, and long enough with them, to convince our fenfes, fo far as not to be cavilled out of the very exiftence of thofe fenfes at that time, which fome of our countrymen and friends would abfolutely attempt to do. They are of a copper colour, with long black hair; and fome of them are certainly nine feet, if they do not exceed it. The commodore, who is very near fix feet, could but juft reach the top of one of their heads, which he attempted on tip-toes, and there were feveral taller than the perfon on whom the experiment was tried. They are prodigious ftout, and as well and as proportionally made as ever I faw people in my life. That they have fome kind of arms among them, is, I think, indifputable, from their taking methods to convince us they had none at that time about them. The women, I think, bear much the fame proportion to the men as our Europeans do; there was hardly a man there lefs than eight feet, moft of them confiderably more. The women, I believe, run from feven and a half to eight feet.—Their horfes were ftout and bony, but not remarkably tall; they are, in my opinion, from 15 to 15½ hands. They had a great number of dogs, about the fize of a middling pointer, with a fox nofe. They continued on the beach till we got under way, which was two hours after we got on board. I believe they had fome expectations of our returning again; but as foon as they faw us getting off, they betook themfelves to the country.

"The country of Patagonia is rather hilly, though not remarkably fo. You have here and there a ridge of hills, but no very high ones. We lay fome time at Port Defire, which is not a great way to the northward of the ftraits, where we traverfed the country many miles round. We found fire-brands in different places, which convinced us there had been people, and we fuppofe them to have been the Patagonians. The foil is fandy, produces nothing but a coarfe harfh grafs, and a few fmall fhrubs, of which Sir John Narborough remarked, he could not find one of fize enough to make the helve of a hatchet; which obfervation we found very juft. It was fome time in the winter we made this vifit to our gigantic friends. I am debarred being fo particular as I could wifh, from the lofs of my journals, which were demanded by their lordfhips of the admiralty immediately upon our return."

That the whole of this account is true, we cannot affert; but that the writer has been mifled in fome refpects, and mifinformed with regard to fome of his facts, is at leaft probable: for Captain Wallis, who went out to the ftraits of Magellan after Byron's return, gives a different turn to many of the obfervations; and with refpect to the ftature of the people, he differs very materially. We fhall give the following epitome of his remarks on what occurred to him.—He had three fhips with him, which entered the ftraits on the 16th December 1766, and came to an anchor in a bay fouth of Cape Virgin Mary, where they were immediately accofted by a whole troop of Patagonians, who made figns for them to come on fhore. The captain, having made previous difpofitions for the fecurity of his men in cafe of an attack, manned all the boats belonging to the three fhips, and with a party of marines landed on the beach where thofe giants had affembled. The commanders of the three fhips, and moft of their officers, were of this party. On their leaping afhore, the Indians feemed to welcome them; and being by figns defired to retreat, they all fell back, and made room for the marines to form. When they were drawn up, Captain Wallis advanced, and by figns directed the Indians to feat themfelves in a femicircle, which they readily underftood and obeyed. He then diftributed among them knives, fciffars, buttons, beads, combs, and particularly ribbons, with which he complimented the women, who received them with a mixture of pleafure and refpect. He then gave them to underftand that he had ftill more valuable articles to beftow, and fhowed them axes and bill-hooks; but, at the fame time, pointed to fome guanicoes and oftriches, intimating that he expected fome of thofe in return: but they either did not, or would not, underftand him; fo that no traffic took place.

The whole company that were affembled on this occafion, had each a horfe, with a faddle and bridle. The faddle had a fort of ftirrups, and the bridle was made of thongs of leather very well put together, for the purpofe of guiding the horfes. The women, as well as the men, rode aftride. The men, in general, wore each a wooden fpur: but one of them had a large pair of Spanifh fpurs, brafs ftirrups, and a Spanifh fcimitar. Their horfes were nimble and fpirited, but fmall in proportion to their riders, feemingly not above 14 hands high. Their dogs were of the Spanifh breed. The captain, having purpofely provided himfelf with meafuring rods, found that the talleft man among them meafured only fix feet feven inches high; feveral were within an inch or two as tall; but the ordinary fize was from five feet ten inches to fix feet. It is pity that none of our voyagers thought of meafuring the whole fize of one of thofe gigantic men. They tell us, indeed, that they are well made, that they are proportionally large, and that they are robuft and bony; but they give us no criterion to judge of their bulk, nor one inftance of their extraordinary ftrength. As they are reprefented not only peaceable,

peaceable, but remarkably tractable, some trials might have been made of the weight they could have lifted, and how much they could exceed in that respect the strongest man in the ships. This, in a great measure, would have determined the point, which is yet left doubtful by the different relations that are given by the different voyagers who have seen these people, no two of them agreeing in the same description. All agree, however, that their hair is black, and harsh like bristles; that they are of a dark copper colour, and that their features are rather handsome than ugly; that they clothe themselves decently with the skins of guanicoes; that they paint themselves variously; and there is reason to suspect, that by that variety they distinguish their tribes. Those seen by Commodore Byron were painted round both eyes, no two of them alike; those seen by Captain Wallis had only a red circle round the left eye; and those seen by Bougainville had no circle round the eyes, but had their cheeks painted red. This may account for the different reports of voyagers concerning their stature: it is not impossible, nay, it is very probable, that they may vary in this particular, according to their tribes; as is seen in the Highlands of Scotland, where one clan of the Campbells is remarkably tall, and another of the Frasers remarkably short. Were it not for some such natural discrimination, there could not be so wide a difference in the descriptions of gentlemen, who, having no ends to serve, either in falsifying one another's reports, or in imposing upon the public, cannot be supposed to mistake wilfully.

One remarkable observation made by our voyagers must not be omitted; and that is, that though our people could distinguish but one word of their language, which the English pronounce *chewow*, and the French *shawa*, yet the Patagonians could repeat whole sentences after our men more distinctly than almost any European foreigner of what nation soever. This appears the more singular, as, among the islanders between the tropics, it was hardly possible to make them articulate any of our words. Sydney Parkinson, in a specimen he has given us, says, that though the English remained at Otaheite three months, the nearest the natives could approach the sound of *Cook* was *Toote; Banks*, *Opane; Solander*, *Tolano; Gore*, *Towara; Monkhouse*, *Mata;* and so of the rest: whereas the Patagonians presently got by heart this sentence of invitation, *Come ashore, Englishmen!* which they showed they well understood, by repeating it afterwards whenever the ships came so near the shore as to be within call.

Another very remarkable particular is, that they had none of the characters of a ferocious people; there was no offensive weapon among them, except the scimitar already mentioned. The men, indeed, had a kind of sling, which they use in hunting, consisting of two round stones of about a pound weight each, connected together by a thong. These stones were fastened to the extremities of the thong; and, when they threw them, they held one stone in the hand, and swung the other about the head. "They are so expert in the management of this double-headed shot (says the writer of the voyage), that they will hit a mark not bigger than a shilling with both these stones at the distance of fifteen yards; but their method of availing themselves of their dexterity against the guanicoe and ostrich is, to fling the stones so as to entangle their legs, by which means they are retarded in their flight, and easily overtaken. Bougainville speaks of these slings as common among other Indian nations in South America; but we do not remember to have seen this assertion confirmed by any other voyager.

These people certainly dress differently as well as paint differently; for the dress described by Bougainville is very unlike the dress of those seen by the English voyagers. Captain Wallis invited some of them on board his ship: but, among all the wonders that were shown them, none seemed to attract their notice so much as the looking-glasses: they looked in the glasses and at each other; they laughed and gazed, and gazed again and laughed; in short, there was no end to their merriment when in possession of this article of curiosity. They ate whatever was given them, but would drink nothing but water. In this they differ from all the tribes of Indians in North America, who are immoderately fond of spirituous liquors. They admired the European sheep, hogs, and poultry; but did not seem over-desirous of any thing they saw except clothes. When the marines were exercised to entertain them, they appeared disconcerted; an old man among them made signs, by striking his breast, and tumbling down and lying as if he had been dead upon deck, that he knew the effect of their guns; and none of them seemed easy till the firing was over. When the captain had satisfied his own curiosity, and, as he imagined, theirs, he gave them to understand, that he was going to sail, and that they must depart; which they were very unwilling to do. However, having given each of them a canvas bag, with some needles ready threaded, a knife, a pair of scissars, a few beads, a comb, and a looking-glass, he dismissed them, with great reluctance on their part, particularly on that of the old man's, who by very significant signs expressed his desire to stay till sunset.

PATAGONULA, in *Botany*, a genus of plants belonging to the pentandria class. See Botany *Index*.

PATAN, a kingdom of Asia, in the East Indies, and in the peninsula of Malacca, and on the eastern coast between the kingdoms of Siam and Paha. The inhabitants are partly Mahometans and partly Gentoos; but they are all very voluptuous. The air is wholesome, though very hot; and they have no seasons but the winter and summer. The former is more properly the rainy season; and contains the months of November, December, and January. The woods are full of elephants and many wild animals. Some voyagers pretend that this country is governed by a queen, who never marries, but may have as many gallants as she pleases. They have some trade with the Chinese; and the principal town is of the same name, which is one of the strongest in these parts, having a well defended harbour.

Patan, a town of Asia, and capital of a province of the same name, in the dominions of the Great Mogul; it is very little known. E. Long. 109. 0. N. Lat. 27. 30.

PATAVINITY, among critics, denotes a peculiarity of Livy's diction; derived from Patavium or Padua, the place of his nativity; but wherein this patavinity consists, they are by no means agreed.

Asinius Pollio, according to Quintilian, taxed Livy with patavinity. But what he meant by this censure

we believe no man can ſay. Morhof believes it to be a ſingular turn of expreſſion, and ſome phraſes peculiar to the Paduefe. All we certainly know about it is, that it was a fault in the language of Livy, not in the ſentiments or manners. In all probability, it is one of thoſe delicacies that are loſt in a dead language. Dan. Georg. Morhof publiſhed a treatiſe *De Patavinitate Liviana*, at Kiel, in 1685, where he explains, very learnedly, the urbanity and peregrinity of the Latin tongue.

PATARA, (Livy, Mela) ; the capital of Lycia, to the eaſt of the mouth of the river Xanthus ; famous for a temple and oracle of Apollo, thence called *Patareus*, three ſyllables only ; but *Patareus*, (Horace). For the ſix winter months, Apollo gave anſwers at Patara ; and for the ſix ſummer at Delos, (Virgil, Servius) : theſe are the *Lyciæ Sortes* of Virgil. The town was ſituated in a peninſula, called *Liciorum Cherſoneſus*, (Stephanus). Acts xxi. 1. St Paul in his paſſage from Philippi to Jeruſalem, came to Miletus, hence to Coos, then to Rhodes, and from Rhodes to Patara ; where having found a ſhip that was bound for Phœnicia, he went on board and arrived at Jeruſalem, to be at the feaſt of Pentecoſt.

PATAVIUM, (Tacitus, Strabo), a town of the Tranſpadana, ſituated on the left or north bank of the Medoacus Minor ; founded by Antenor the Trojan, (Mela, Virgil, Seneca) ; *Patavini*, the people, (Livy) ; who himſelf was a native, and by Aſinius Pollio charged with patavinity. Now *Padua*, in the territory and to the weſt of Venice. E. Long. 12. 15. N. Lat. 45. 30.

PATAY, a town of France, in the province of Orleannois, remarkable for the defeat of the Engliſh in 1429, and where Joan of Arc did wonders. E. Long. 1. 43. N. Lat. 48. 5.

PATE, in *Fortification*, a kind of platform, reſembling what is called an *horſe's ſhoe*.

PATEE, or PATTEE, in *Heraldry*, a croſs, ſmall in the centre, and widening to the extremities, which are very broad.

PATELLA, or KNEE-PAN, in *Anatomy*. See ANATOMY *Index*.

PATELLA, or LIMPET, a genus of ſhell-fiſh belonging to the order of vermes teſtacea. See CONCHOLOGY *Index*.

PATELLA, in the Hiſtory of Inſects, a name given by Liſter and other authors to a little huſk or ſhell, found on the bark of the cherry, plum, roſe, and other trees, containing an animal within, and uſeful in colouring. Theſe patellæ are of the form of globes, except where they adhere to the tree, and are for the moſt part of a ſhining cheſnut colour. The huſk itſelf ſtrikes a very fine crimſon colour on paper, and within it is found a white maggot which is of no value : this, in time, hatches into a very ſmall but beautiful bee. The ſize of this bee is about half that of an ant. They have a ſting like bees, and three ſpots placed in a triangle on the forehead, which are ſuppoſed to be eyes. They are of a black colour, and have a large round whitiſh or pale yellow ſpot on the back. The upper pair of wings are ſhaded and ſpotted, but the under pair are clear. It might be worth while to try the ſhells or huſks in order to diſcover whether the colour they yield might not be uſeful. It is to be remarked, that the deepeſt coloured huſks afford the fineſt and deepeſt purple : they muſt be uſed while the animal in them is in the maggot form ; for when it is changed into the bee ſtate the ſhell is dry and colourleſs. Liſter, who firſt obſerved theſe patellæ, went ſo far on comparing them with the common kermes, as to aſſert that they were of the ſame nature with that production : but his account of their being the workmanſhip of a bee, to preſerve her young maggot in, is not agreeable to the true hiſtory of the kermes ; for that is an inſect of a very peculiar kind. He has in other inſtances been too juſtly cenſured for his precipitancy of judging of things, and perhaps has fallen into an error by means of it here. It is very poſſible that theſe patellæ may be the ſame ſort of animals with the kermes, but then it produces its young within this ſhell or huſk, which is no other than the ſkin of the body of the mother animal ; but as there are many flies whoſe worms or maggots are lodged in the bodies of other animals, it may be that this little bee may love to lay its egg in the body of the proper inſect, and the maggot hatched from that egg may eat up the proper progeny, and, undergoing its own natural changes there, iſſue out at length in form of the bee. This may have been the caſe in ſome few which Dr Liſter examined ; and he may have been miſled by this to ſuppoſe it the natural change of the inſect.

PATENT, in general, denotes ſomething that ſtands open or expanded : thus a leaf is ſaid to be patent, when it ſtands almoſt at right angles with the ſtalk.

PATENT, or *Letters Patent*. See LETTER.

PATER NOSTER, the *Lord's Prayer*, ſo called from the two firſt words thereof in Latin.

PATER *Noſter*, iſlands of Aſia, in the Eaſt Indian ſea, ſo called becauſe of the great number of rocks, which ſailors have likened to the beads with which the Papiſts tell their pater-noſter. They abound in corn and fruits, and are very populous.

PATER *Patratus*, was the name of the firſt and principal perſon in the college of heralds called *Feciales*. Some ſay the Pater Patratus was a conſtant officer and perpetual chief of that body ; and others ſuppoſe him to have been a temporary miniſter, elected upon account of making peace or denouncing war, which were both done by him. See FECIALES.

PATERA, among antiquaries, a goblet or veſſel uſed by the Romans in their ſacrifices ; wherein they offered their conſecrated meats to the gods, and wherewith they made libations. See SACRIFICE and LIBATION.

The word is Latin, formed from *pateo*, " I am open ;" *quod patet*, " becauſe it has a great aperture ;" in contradiſtinction to bottles, &c. which have only narrow necks, or whoſe aperture is leſs than the body of the veſſel.

On medals the patera is ſeen in the hands of ſeveral deities ; and frequently in the hands of princes, to mark the ſacerdotal authority joined with the imperial, &c.

Hence F. Joubert obſerves, that beſides the patera, there is frequently an altar upon which the patera ſeems to be pouring its contents.

The patera was of gold, ſilver, marble, braſs, glaſs, or

earth ;

earth; and they uſed to incloſe it in urns with the aſhes of the deceaſed, after it had ſerved for the libations of the wine and liquors at the funeral.

The patera is an ornament in architecture, frequently ſeen in the Doric frieze, and the tympans of arches; and they are ſometimes uſed by themſelves, to ornament a ſpace; and in this caſe it is common to hang a ſtring of huſks or drapery over them: ſometimes they are much enriched with foliage, and have a maſk or a head in the centre.

PATERCULUS, Caius Velleius, an ancient Roman hiſtorian, who flouriſhed in the reign of Tiberius Cæſar, was born in the year of Rome 735. His anceſtors were illuſtrious for their merit and their offices. His grandfather eſpouſed the party of Tiberius Nero, the emperor's father; but being old and infirm, and not able to accompany Nero when he retired from Naples, he ran himſelf through with his ſword. His father was a ſoldier of rank, and ſo was Paterculus himſelf. He was a military tribune when Caius Cæſar, a grandſon of Auguſtus, had an interview with the king of the Parthians, in an iſland of the river Euphrates, in the year 753. He commanded the cavalry in Germany under Tiberius; and accompanied that prince for nine years ſucceſſively in all his expeditions. He received honourable rewards from him; but we do not find that he was preferred to any higher dignity than the prætorſhip. The praiſes he beſtows upon Sejanus give ſome probability to the conjecture, that he was looked upon as a friend of this favourite, and conſequently that he was involved in his ruin. His death is placed by Mr Dodwell in the year of Rome 784, when he was in his 50th year.

He wrote an abridgement of the Roman Hiſtory in two books, which is very curious. His purpoſe was only to deduce things from the foundation of Rome to the time wherein he lived; but he began his work with things previous to that memorable era; for, though the beginning of his firſt book is wanting, we yet find in what remains of it, an account of many cities more ancient than Rome. He promiſed a larger hiſtory; and no doubt would have executed it well: for during his military expeditions he had ſeen, as he tells us, the provinces of Thrace, Macedonia, Achaia, Aſia Minor, and other more eaſterly regions; eſpecially upon the ſhores of the Euxine ſea, which had furniſhed his mind with much entertaining and uſeful knowledge. In the Abridgement which we have, many particulars are related that are nowhere elſe to be found; and this makes it the more valuable. The ſtyle of Paterculus, though miſerably diſguiſed through the careleſſneſs of tranſcribers, and impoſſible to be reſtored to purity for want of manuſcripts, is yet manifeſtly worthy of his age, which was the time of pure Latinity. The greateſt excellence of this hiſtorian lies in his manner of commending and blaming thoſe he ſpeaks of; which he does in the fineſt terms and moſt delicate expreſſions. He is, however, condemned, and indeed with the greateſt reaſon, for his partiality to the houſe of Auguſtus; and for making the moſt extravagant eulogies, not only upon Tiberius, but even upon his favourite *Sejanus*: whom, though a vile and cruel monſter, Paterculus celebrates as one of the moſt excellent perſons the Roman commonwealth had produced. Lipſius, though he praiſes him in other reſpects, yet cenſures him moſt ſeverely for his inſincerity and partiality. "Velleius Paterculus (ſays he) raiſes my indignation: he repreſents Sejanus as endowed with all good qualities. The impudence of this hiſtorian! But we know that he was born, and died, to the deſtruction of mankind. After many commendations, he concludes, that Livia was a woman more reſembling the gods than men: and as to Tiberius, he thinks it a crime to ſpeak otherwiſe of him than as of an immortal Jove. What ſincere and honeſt mind can bear this? On the other hand, how artfully does he everywhere conceal the great qualities of Cæſar Germanicus! how obliquely does he ruin the reputation of Agrippina and others, whom Tiberius was thought to hate! In ſhort, he is nothing but a court-proſtitute. You will ſay, perhaps, it was unſafe to ſpeak the truth at thoſe times: I grant it; but if he could not write the truth, he ought not to have written lies: none are called to account for ſilence." La Mothe le Vayar has made a very juſt remark upon this occaſion: "The ſame fault (ſays he) may be obſerved in many others, who have written the hiſtory of their own times, with a deſign to be publiſhed while they lived."

It is ſtrange, that a work ſo elegant and worthy to be preſerved, and of which, by reaſon of its ſhortneſs, copies might be ſo eaſily taken, ſhould have been ſo near being loſt. One manuſcript only has had the luck to be found, as well of this author among the Latins as of Heſychius among the Greeks: in which, ſays a great critic of our own nation, "The faults of the ſcribes are found ſo numerous, and the defects ſo beyond all redreſs, that notwithſtanding the pains of the learned and moſt acute critics for two whole centuries, theſe books ſtill are, and are like to continue, a mere heap of errors." No ancient author but Priſcian makes mention of Paterculus: the moderns have done him infinitely more juſtice, and have illuſtrated him with notes and commentaries. He was firſt publiſhed from the manuſcript of Morhac, by Rhenanus, at Baſil in 1520: afterwards by Lipſius at Leyden in 1581; then by Gerard Voſſius in 1639; next by Boeclerus at Straſburg in 1642; then by Thyſius and others; and, laſtly, by Peter Burman at Leyden, 1719, in 8vo. To the Oxford edition in 1693, 8vo, were prefixed the *Annales Velleiani* of Mr Dodwell, which ſhow deep learning and a great knowledge of antiquity.

PATH, in general, denotes the courſe or track marked out or run over by a body in motion.

For the path of the moon, &c. ſee Moon, &c. Astronomy *Index*.

PATHETIC, whatever relates to the paſſions, or that is proper to excite or awake them. The word comes from the Greek παθος, *paſſion* or *emotion*. See Passion.

Pathetic, in *Muſic*, ſomething very moving, expreſſive, or paſſionate; capable of exciting pity, compaſſion, anger, or other paſſions. Thus we ſpeak of the pathetic ſtyle, a pathetic figure, pathetic ſong, &c. The chromatic genus, with its greater and leſſer ſemitones, either aſcending or deſcending, is very proper for the pathetic; as is alſo an artful management of diſcords; with a variety of motions, now briſk, now languiſhing, now ſwift, now ſlow.

Nieuwentyt ſpeaks of a muſician at Venice who ſo excelled in the pathetic, that he was able to play any of his auditors into diſtraction: he ſays alſo, that the great

great means he made ufe of it was the variety of motions, &c.

PATHOGNOMONIC, among *Phyficians*, an appellation for a fymptom, or concourfe of fymptoms, that are infeparable from a diftemper, and are found in that only, and in no other.

PATHOLOGY, that part of medicine which explains the nature of difeafes, their caufes and fymptoms. See MEDICINE.

PATHOS, a Greek term, literally fignifying paffion.

PATHROS, a city and canton of Egypt, of which the prophets Jeremiah and Ezekiel make mention; Jerem. xliv. 1. 15. Ezek. xxix. 14. xxx. 14. We do not very well know its fituation, though Pliny and Ptolemy the geographer fpeak of it by the name of Phaturis; and it appears to have been in Upper Egypt. Ifaiah (xii. 2.) calls it Pathros; and it is the country of the Pathrufim, the pofterity of Mizraim, of whom Mofes fpeaks, Gen. x. 14. Ezekiel threatens them with an entire ruin. The Jews retired thither notwithftanding the remonftrances of Jeremiah; and the Lord fays by Ifaiah, that he will bring them back from thence.

PATIENCE, that calm and unruffled temper with which a good man bears the evils of life, from a conviction that they are at leaft permitted, if not fent, by the beft of Beings, who makes all things work together for good to thofe who love and fear him.

The evils by which life is embittered may be reduced to thefe four: 1. Natural evils, or thofe to which we are by nature fubject as men, and as perifhable animals. The greateft of thefe are, the death of thofe whom we love, and of ourfelves. 2. Thofe from which we might be exempted by a virtuous and prudent conduct, but which are the infeparable confequences of imprudence or vice, which we fhall call punifhments; as infamy proceeding from fraud, poverty from prodigality, debility and difeafe from intemperance. 3. Thofe by which the fortitude of the good are exercifed; fuch as the perfecutions raifed againft them by the wicked. To thefe may be added, 4. The oppofition againft which we muft perpetually ftruggle, arifing from the diverfity of fentiments, manners, and characters of the perfons among whom we live.

Under all thefe evils patience is not only neceffary but ufeful: it is neceffary, becaufe the laws of nature have made it a duty, and to murmur againft natural events is to affront providence; it is ufeful, becaufe it renders our fufferings lighter, fhorter, and lefs dangerous.

Is your reputation fullied by invidious calumnies? rejoice that your character cannot fuffer but by falfe imputations. You are arraigned in a court of judicature, and are unjuftly condemned: paffion has influenced both your profecutor and your judge, and you cannot forbear repining that you fuffer although innocent. But would it have been better that you fhould have fuffered being guilty? Would the greateft misfortune that can befal a virtuous man be to you a confolation? The opulence of a villain, the elevated ftation to which he is raifed, and the honours that are paid to him, excite your jealoufy, and fill your bofom with repinings and regret. What! fay you, are riches, dignity, and power, referved for fuch wretches as this? Ceafe thefe groundlefs murmurs. If the poffeffions you regret were real benefits, they would be taken from the wicked and transferred to you. What would you fay of a fuccefsful hero, who, having delivered his country, fhould complain that his fervices were ill requited, becaufe a few fugar-plums were diftributed to fome children in his prefence, of which they had not offered him a fhare? Ridiculous as this would appear, your complaints are no better founded. Has the Lord of all no reward to confer on you but perifhable riches and empty precarious honour?

It is fancy, not the reafon of things, that makes life fo uneafy to us. It is not the place nor the condition, but the mind alone, that can make any body happy or miferable.

He that values himfelf on confcience, not opinion, never heeds reproaches. When we are evil fpoken of, if we have not deferved it, we are never the worfe; if we have, we fhould mend.

Tiberius the Roman emperor, at the beginning of his reign, acted in moft things like a truly generous, good natured, and clement prince. All flanderous reports, libels, and lampoons upon him and his adminiftration, he bore with extraordinary patience; faying, "That in a free ftate the thoughts and tongues of every man ought to be free;" and when the fenate would have proceeded againft fome who had publifhed libels againft him, he would not confent to it; faying, "We have not time enough to attend to fuch trifles; if you once open a door to fuch informations, you will be able to do nothing elfe; for under that pretence every man will revenge himfelf upon his enemies by accufing them to you." Being informed that one had fpoken detractingly of him: "If he fpeak ill of me," fays he, "I will give him as good an account of my words and actions as I can; and if that be not fufficient, I will fatisfy myfelf with having as bad an opinion of him as he has of me." Thus far even Tiberius may be an example to others.

Men will have the fame veneration for a perfon who fuffers adverfity without dejection, as for demolifhed temples, the very ruins of which are reverenced and adored.

A virtuous and well-difpofed perfon, is like to good metal; the more he is fired, the more he is refined; the more he is oppofed, the more he is approved; wrongs may well try him and touch him, but cannot imprint in him any falfe ftamp.

The man therefore who poffeffes this virtue (patience), in this ample fenfe of it, ftands upon an eminence, and fees human things below him: the tempeft indeed may reach him; but he ftands fecure and collected againft it upon the bafis of confcious virtue, which the fevereft ftorms can feldom fhake, and never overthrow.

Patience, however, is by no means incompatible with fenfibility, which, with all its inconveniences, is to be cherifhed by thofe who underftand and wifh to maintain the dignity of their nature. To feel for others, difpofes us to exercife the amiable virtue of charity, which our religion indifpenfably requires. It conftitutes that enlarged benevolence which philofophy inculcates, and which is indeed comprehended in Chriftian charity. It is the privilege and the ornament of man; and the pain

which

which it causes is abundantly recompensed by that sweet sensation which ever accompanies the exercise of beneficence.

To feel our own misery with full force is not to be deprecated. Affliction softens and improves the heart. Tears, to speak in the style of figure, fertilize the soil in which the virtues grow. And it is the remark of one who understood human nature, that the faculties of the mind, as well as the feelings of the heart, are meliorated by adversity.

But in order to promote these ends, our sufferings must not be permitted to overwhelm us. We must oppose them with the arms of reason and religion; and to express the idea in the language of the philosopher, as well as the poet, of Nature, every one, while he is compelled to feel his misfortunes like a man, should resolve also to bear them like a man.

Resign'd in ev'ry state,
With patience bear, with prudence push, your fate;
By suffering well our fortune, we subdue,
Fly when she frowns, and when she calls pursue.

PATIGUMO (a corruption of the words *pate-de guimauve*); the name of a sort of paste or cakes much used on the continent as an agreeable and useful remedy for catarrhal defluxions, and supposed by Dr. Percival to consist of gum-arabic combined with sugar and the whites of eggs (see the article HUNGER). But we have been informed that the powdered substance of the marshmallow is the chief ingredient of the composition.

PATIN, GUY, professor of physic in the royal college of Paris, was born in 1602. He made his way into the world merely by the force of his genius, being at first corrector of a printing-house. He was a man of great wit and erudition: he spoke with the gravity of a Stoic, but his expressions were very satirical. He hated bigotry, superstition, and knavery; had an upright soul, and a well-disposed heart. He was a most tender father, courteous to every body, and polite in the highest degree. He died in 1672, and did not owe his reputation to any writings published in his lifetime upon physic; but his letters which appeared after his death have rendered his name famous. He left a son mentioned in the ensuing article.

PATIN, *Charles*, who made a great figure in the world, and excelled in the knowledge of medals. He was born in Paris in 1633; and made so surprising a progress, that he maintained theses in Greek and Latin, on all parts of philosophy, in 1647. He studied the law in compliance to an uncle, and was admitted an advocate in the parliament of Paris; but could not lay aside that of physic, for which he always had an inclination. He therefore quitted the law, and devoted himself to physic; in which, after taking the doctor's degree, he applied himself to practice with great success. He afterwards travelled into Germany, Holland, England, Switzerland, and Italy. In 1676, he was appointed professor of physic in Padua; and three years after was created a knight of St Mark. He died in that city in 1694. His works are many, and well known to the learned world. His wife too, and his daughters, were authoresses.

PATKUL, JOHN REINHOLD, was born of a noble family in Livonia, a northern province belonging to the crown of Sweden. The Livonians having been stript of their privileges, and great part of their estates, by Charles XI. Patkul was deputed to make their complaint; which he did with such eloquence and courage, that the king, laying his hand upon his shoulder, said, 'You have spoken for your country as a brave man should, and I esteem you for it.'

Charles, however, who added the baseness of hypocrisy to the ferocity of a tyrant, was determined to punish the zeal and honesty which he thought fit to commend; and a few days afterwards caused Patkul to be declared guilty of high treason, and condemned to die. Patkul, however, found means to escape into Poland, where he continued till Charles was dead. He hoped that his sentence would have been then reversed, as it had been declared unjust even by the tyrant that procured it: but being disappointed in this expectation, he applied to Augustus king of Poland, and solicited him to attempt the conquest of Livonia from the Swedes; which, he said, might be easily effected, as the people were ready to shake off their yoke, and the king of Sweden was a child incapable of compelling their subjection.

Augustus possessed himself of Livonia in consequence of this proposal; and afterwards, when Charles XII. entered the province to recover it, Patkul commanded in the Saxon army against him. Charles was victorious; and Patkul, some time afterwards, being disgusted at the haughty behaviour of General Fleming, Augustus's favourite, entered into the service of the Czar, with whom Augustus was in strict alliance, and a little before Charles compelled Augustus to abdicate the throne of Poland, and his subjects to elect Stanislaus in his stead. The Czar sent Patkul, with the title of his ambassador, into Saxony, to prevail with Augustus to meet him at Grodno, that they might confer on the state of their affairs. This conference took place; and immediately afterwards the Czar went from Grodno to quell a rebellion in Astracan. As soon as the Czar was gone, Augustus, to the surprise of all Europe, ordered Patkul, who was then at Dresden, to be seized as a state criminal. By this injurious and unprecedented action, Augustus at once violated the law of nations, and weakened his own interest; for Patkul was not only an ambassador, but an ambassador from the only power that could afford him protection. The cause, however, was this: Patkul had discovered that Augustus's ministers were to propose a peace to Charles upon any terms; and had therefore formed a design to be beforehand with them, and procure a separate peace between Charles and his new master the Czar. The design of Patkul was discovered; and, to prevent its success, Agustus ventured to seize his person, assuring the Czar that he was a traitor, and had betrayed them both.

Augustus was soon after reduced to beg a peace of Charles at any rate; and Charles granted it upon certain conditions, one of which was, that he should deliver up Patkul. This condition reduced Augustus to a very distressful dilemma: the Czar, at this very time, reclaimed Patkul as his ambassador; and Charles demanded, with threats, that he should be put into his hands. Augustus therefore contrived an expedient by which he hoped to satisfy both: he sent some guards to deliver Patkul, who was prisoner in the castle of Konigstein, to the Swedish troops; but by secret orders

Patkul. ders privately difpatched, he commanded the governor to let him efcape. The governor, though he received this order in time, yet difappointed its intention by his villany and his avarice. He knew Patkul to be very rich; and having it now in his power to fuffer him to efcape with impunity, he demanded of Patkul a large fum for the favour: Patkul refufed to buy that liberty which he made no doubt would be gratuitoufly reftored, in confequence of the Czar's requifition and remonftrance; and, in the mean time, the Swedifh guards arrived with the order for his being delivered up to them. By this party he was firft carried to Charles's head quarters at Albranftadt, where he continued three months, bound to a ftake with a heavy chain of iron. He was then conducted to Cafimir, where Charles ordered him to be tried; and he was by his judges found guilty. His fentence depended upon the king; and after having been kept a prifoner fome months, under a guard of Mayerfeldt's regiment, uncertain of his fate, he was, on the 28th of September 1707, towards the evening, delivered into the cuftody of a regiment of dragoons, commanded by Colonel Nicholas Hielm. On the next day, the 29th, the colonel took the chaplain of his regiment afide, and telling him that Patkul was to die the following day, ordered him to acquaint him with his fate, and prepare him for it. About this very time he was to have been married to a Saxon lady of great quality, virtue, and beauty; a circumftance which renders his cafe ftill more affecting. What followed in confequence of the colonel's order to the minifter will be related in his own words.

"Immediately after evening fervice I went to his prifon, where I found him lying on his bed. The firft compliments over, I entered upon the melancholy duty of my profeffion, and turning to the officer who had him in charge, told him the colonel's orders were, that I fhould be alone with his prifoner. The officer having withdrawn, Patkul grafping both my hands in his, cried out with moft affecting anxiety and diftrefs, My dear paftor! what are you to declare? what am I to hear? I bring you, replied I, the fame tidings that the prophet brought to King Hezekiah, *Set thine houfe in order, for thou muft die.* To-morrow by this time thou fhalt be no longer in the number of the living! At this terrible warning he bowed himfelf upon his bed and burft into tears. I attempted to comfort him, by faying that he muft, without all doubt, have often meditated on this fubject: Yes, cried he, I know, alas! too well, that we muft all die; but the death prepared for me will be cruel and infupportable. I affured him that the manner of his death was to me totally unknown; but, believing that he would be prepared for it, I was fure his foul would be received into the number of happy fpirits. Here he rofe up, and folding his hands together, Merciful Jefus! let me then die the death of the righteous! A little after, with his face inclined to the wall, where ftood his bed, he broke out into this foliloquy: Auguftus! O Auguftus, what muft be thy lot one day! Muft thou not anfwer for all the crimes thou haft commifted? He then obferved that he was driven out from his country, by a fentence againft his life, pronounced for doing what the king himfelf encouraged him to do, faying to him one day in terms of much kindnefs, 'Patkul, maintain the rights of your country like a man of honour, and with all the fpirit you are capable of.' That flying into an enemy's country was alfo unavoidable, as the country of an ally would not have afforded him protection; but that he was in Saxony a wretched exile, not a counfellor or adviser; that before his arrival every thing was already planned, the alliance with Mufcovy figned, and the meafures with Denmark agreed upon. 'My inclination (faid he, after a paufe) were always to ferve Sweden, though the contrary opinion has prevailed. The elector of Brandenburg owed his title of *king of Pruffia* to the fervices I did him; and when, in recompenfe, he would have given me a confiderable fum of money, I thanked him, and rejected the offer; adding, that the reward I moft wifhed for was to regain the king of Sweden's favour by his interceffion. This he promifed, and tried every poffible method to fucceed, but without fuccefs. After this I laboured fo much for the intereft of the late emperor in his Spanifh affairs, that I brought about what fcarce any other man could have effected. The emperor as an acknowledgement gave me an affignment for 50,000 crowns, which I humbly laid at his feet, and only implored his imperial majefty's recommendation of me to my king's favour: this requeft he immediately granted, and gave his orders accordingly, but in vain. Yet, not to lofe any opportunity, I went to Mofcow while the Swedifh ambaffadors were at that court; but even the mediation of the Czar had no effect. After that I diftributed among the Swedifh prifoners at Mofcow at leaft 100,000 crowns, to fhow the ardent defire I had, by all ways, to regain the favour of their fovereign. Would to heaven I had been equally in earneft to obtain the grace of God.'—At thefe words another fhower of tears fell from his eyes, and he remained for fome moments filent, and overwhelmed with grief. I ufed my beft endeavours to comfort him with the affurance that this grace would not be denied him, provided he fpent the few hours ftill left in earneftly imploring it; for the door of heaven's mercy was never fhut, though that of men might be cruelly fo. 'This (replied he), this is my confolation; for thou art God and not man, to be angry for ever.' He then inveighed bitterly againft Auguftus, and reproached himfelf for having any connection with a wretch who was wholly deftitute of all faith and honour, an atheift, without piety, and without virtue. 'While he was at Warfaw (faid he), and heard the king was advancing to attack him, he found himfelf extremely diftreffed. He was abfolutely without money, and therefore obliged to difmifs fome of his troops. He had recourfe to my affiftance, and intreated me, for the love of God, to borrow whatever fum I could. I procured him 400,000 crowns; 50,000 of which, the very next day, he fquandered on trinkets and jewels, which he gave in prefents to fome of his women. I told him plainly my thoughts of the matter; and by my importunity prevailed, that the Jews fhould take back their toys, and return the money they had been paid for them. The ladies were enraged; and he fwore that I fhould one time or other fuffer for what I had done: there indeed he kept his word; would to God he had always done fo with thofe he employed!" I now left him for a fhort time, and at feven in the evening I returned; and the officer being retired, he accofted me with a fmiling air, and an appearance of much tranquillity, 'Welcome, dear fir, the weight that lay heavy on my heart is removed, and I already feel a fenfible change wrought in my mind. I am Patkul.

ready

ready to die: death is more eligible than the ſolitude of a long impriſonment. Would to heaven only that the kind of it were leſs cruel. Can you, my dear ſir, inform me in what manner I am to ſuffer?" I anſwered, that it had not been communicated to me; but that I imagined it would paſs over without noiſe, as only the colonel and myſelf had notice of it. 'That (replied he) I eſteem as a favour; but have you ſeen the ſentence? or muſt I die, without being either heard or condemned? My apprehenſions are of being put to intolerable tortures.' I comforted him in the kindeſt manner I could; but he was his own beſt comforter from the Word of God, with which he was particularly acquainted; quoting, among many other paſſages, the following in Greek, *We muſt enter into the kingdom of heaven through many tribulations.* He then called for pen and ink, and intreated me to write down what he ſhould dictate. I did ſo, as follows:

'*Teſtamentum, or my laſt will as to the diſpoſition of my effects after my death.*—I. His majeſty King Auguſtus, having firſt examined his conſcience thoroughly, will be ſo juſt as to pay back to my relations the ſum he owes me; which, being liquidated, will amount to 50,000 crowns; and as my relations are here in the ſervice of Sweden, that monarch will probably obtain it for them.'

"At this he ſaid, let us ſtop here a little; I will quickly return to finiſh this will; but now let us addreſs ourſelves to God by prayer. Prayers being ended, 'Now (cried he) I find myſelf yet better, yet in a quieter frame of mind: Oh! were my death leſs dreadful, with what pleaſure would I expiate my guilt by embracing it!—Yes (cried he, after a pauſe), I have friends in different places, who will weep over my deplorable fate. What will the mother of the king of Pruſſia ſay? What will be the grief of the Counteſs Levolde who attends on her? But what thoughts muſt ariſe in the boſom of *her* to whom my faith is plighted? Unhappy woman! the news of my death will be fatal to her peace of mind. My dear paſtor, may I venture to beg one favour of you?" I aſſured him he might command every ſervice in my power. 'Have the goodneſs then (ſaid he, preſſing my hand), the moment I am no more, to write—Alas! how will you ſet about it? a letter to Madam Einſeidelern, the lady I am promiſed to—Let her know that I die her's; inform her fully of my unhappy fate: Send her my laſt and eternal farewell! My death is in truth diſgraceful; but my manner of meeting it will, I hope by heaven's and your aſſiſtance, render it holy and bleſſed. This news will be her only conſolation. Add farther, dear Sir, that I thanked her with my lateſt breath for the ſincere affection ſhe bore me: May ſhe live long and happy: This is my dying wiſh.'—I gave him my hand in promiſe that I would faithfully perform all he deſired.

"Afterwards he took up a book: 'This (ſaid he) is of my own writing. Keep it in remembrance of me, and as a proof of my true regard for religion. I could wiſh it might have the good fortune to be preſented to the king, that he may be convinced with what little foundation I have been accuſed of atheiſm.' Taking it from his hand, I aſſured him that my colonel would not fail to preſent it as ſoon as opportunity offered.

"The reſt of his time was employed in prayer, which he went through with a very fervent devotion. On the 30th of September I was again with him at four in the morning. The moment he heard me he aroſe, and rendering thanks to God, aſſured me he had not ſlept ſo ſoundly for a long time. We went to prayers; and in truth his piety and devout frame of mind were worthy of admiration. About ſix he ſaid he would begin his confeſſion, before the din and clamour of the people without could riſe to diſturb his thoughts. He then kneeled down, and went through his confeſſion in a manner truly edifying. The ſun beginning to appear above the horizon, he looked out of the window, ſaying, *Salve feſta dies!* 'This is my wedding-day. I looked, alas! for another, but this is the happier; for to-day ſhall my ſoul be introduced by her heavenly bridegroom into the aſſembly of the bleſſed!' He then aſked me, whether I yet knew in what way he was to die? I anſwered, that I did not. He conjured me, by the ſacred name of Jeſus, not to forſake him; for that he ſhould find in my company ſome conſolation even in the midſt of tortures. Caſting his eye on the paper that lay on the table, 'This will (ſaid he) can never be finiſhed.' I aſked him, whether he would put his name to what was already written? 'No (replied he, with a deep ſigh), I will write that hated name no more. My relations will find their account in another place; ſalute them for me.' He then addreſſed himſelf again to God in prayer, and continued his devotions till the lieutenant entered to conduct him to the coach. He wrapped himſelf up in his cloak, and went forward a great pace, guarded by 100 horſemen. Being arrived at the place of execution, we found it ſurrounded by 300 foot ſoldiers; but at the ſight of the ſtakes and wheels, his horror is not to be deſcribed. Claſping me in his arms, 'Beg of God (he exclaimed) that my ſoul may not be thrown into deſpair amidſt theſe tortures!' I comforted, I adjured him to fix his thoughts on the death of Jeſus Chriſt, who for our ſins was nailed to a croſs.

"Being now on the ſpot where he was to ſuffer, he bid the executioner to do his duty well, and put into his hands ſome money which he got ready for that purpoſe. He then ſtretched himſelf out upon the wheel; and while they were ſtripping him naked, he begged me to pray that God would have mercy on him, and bear up his ſoul in agony. I did ſo; and turning to all the ſpectators, ſaid to them, Brethren, join with me in prayer for this unhappy man. 'Yes (cried he), aſſiſt me all of you with your ſupplications to heaven.' Here the executioner gave him the firſt ſtroke. His cries were terrible: 'O Jeſus! Jeſus! have mercy upon me.' This cruel ſcene was much lengthened out, and of the utmoſt horror; for as the headſman had no ſkill in his buſineſs, the unhappy victim received upwards of 15 ſeveral blows, with each of which were intermixed the moſt piteous groans and invocations of the name of God. At length, after two ſtrokes given on the breaſt, his ſtrength and voice failed him. In a faultering dying tone, he was juſt heard to ſay, 'Cut off my head!' and the executioner ſtill lingering, he himſelf placed his head on the ſcaffold: After four ſtrokes with an hatchet, the head was ſeparated from the body, and the body quartered. Such was the end of the renowned Patkul."

Charles XII. has been very generally and ſeverely cenſured for not pardoning him, and we are not inclined to vindicate the ſovereign. Yet it muſt be remembered, that Patkul was guilty of a much greater crime than that which drew upon him the diſpleaſure of Charles XI.

Patkul || Patna.

XI. He incited foreign powers to attack his country when under the government of a boy, hoping, as he said himself, that it would in such circumstances become an easy conquest. He was therefore a rebel of the worst kind; and where is the absolute monarch that is ready to pardon such unnatural rebellion? Let it be remembered, too, that Charles, among whose faults no other instance of cruelty has been numbered, certainly thought that, in ordering the execution of Patkul, he was discharging his duty. That monarch, it is known, believed in the possibility of discovering the philosopher's stone. Patkul, when under sentence of death, contrived to impose so far upon the senate at Stockholm, as to persuade them that he had, in their presence, converted into gold a quantity of baser metal. An account of this experiment was transmitted to the king, accompanied with a petition to his majesty for the life of so valuable a subject; but Charles, blending magnanimity with his severity, replied with indignation, that he would not grant to interest what he had refused to the call of humanity and the intreaties of friendship.

PATMOS, in *Ancient Geography*, one of the Sporades (Dionysius); 30 miles in compass (Pliny); concerning which we read very little in authors. It was rendered famous by the exile of St John, and the Revelation showed him there. The greatest part of interpreters think that St John wrote them in the same place during the two years of his exile; but others think that he did not commit them to writing till after his return to Ephesus. The island of Patmos is between the island of Icaria and the promontory of Miletus. Nothing has done it more honour than to have been the place of the banishment of St John. It is now called *Patino*, or *Pactino*, or *Patmol*, or *Palmosa*. Its circuit is five and twenty or thirty miles. It has a city called *Patmos*, with a harbour, and some monasteries of Greek monks. It is at present in the hands of the Turks. It is considerable for its harbours; but the inhabitants derive little benefit from them, because the corsairs have obliged them to quit the town, and retire to a hill on which St John's convent stands. This convent is a citadel consisting of several irregular towers, and is a substantial building seated on a very steep rock. The whole island is very barren, and without wood; however, it abounds with partridges, rabbits, quails, turtles, pigeons, and snipes. All their corn does not amount to 1000 barrels in a year. In the whole island there are scarcely 300 men: but there are above 20 women to one man, who expect that all strangers who land in the island should carry some of them away. To the memory of St John is an hermitage on the side of a mountain, where there is a chapel not above eight paces long and five broad. Over head they show a chink in the rock, through which they pretend that the Holy Ghost dictated to St John. E. Long. 26. 84. N. Lat. 37. 24.

PATNA, a town of Asia, in the dominions of the Great Mogul, to the north of the kingdom of Bengal, where the English have factories for saltpetre, borax, and raw silk. It is the capital of the province of Bahar, a dependency of Bengal, in the empire of Indostan, situated in a pleasant country, 400 miles east of Agra. It extends seven miles in length on the banks of the Ganges, and is about half a mile in breadth.—Mr Rennel gives strong reasons for supposing it to be the ancient PALIBOTHRA. The town is large and populous, but the houses are built at a distance from each other. E. Long. 85. 40. N. Lat. 45. 25.

Patrea || Patræ.

PATOMACK, a large river of Virginia, in North America, which rises in the Alleghany mountains, separates Virginia from Maryland, and falls into Chesapeake bay. It is about seven miles broad, and is navigable for near 300 miles.

PATONCE, in *Heraldry*, is a cross, flory at the ends; from which it differs only in this, that the ends instead of turning down like a fleur-de-lis, are extended somewhat in the pattee form. See FLORY.

PATRÆ, a city of Achaia. This place was visited by Dr Chandler, who gives the following account of it. "It has often been attacked by enemies, taken, and pillaged. It is a considerable town, at a distance from the sea, situated on the side of a hill, which has its summit crowned with a ruinous castle. This made a brave defence in 1447 against Sultan Morat, and held out until the peace was concluded, which first rendered the Morea tributary to the Turks. A dry flat before it was once the port, which has been choked with mud. It has now, as in the time of Strabo, only an indifferent road for vessels. The house of Nicholas Paul, Esq. the English consul, stood on part of the wall either of the theatre or the odéum. By a fountain was a fragment of a Latin inscription. We saw also a large marble bust much defaced; and the French consul showed us a collection of medals. We found nothing remarkable in the citadel. It is a place of some trade, and is inhabited by Jews as well as by Turks and Greeks. The latter have several churches. One is dedicated to St Andrew the apostle, who suffered martyrdom there, and is of great sanctity. It had been recently repaired. The site by the sea is supposed that of the temple of Ceres. By it is a fountain. The air is bad, and the country round about overrun with the low shrub called *glycyrrhiza* or liquorice."

Of its ancient state, the same author speaks thus: "Patræ assisted the Ætolians when invaded by the Gauls under Brennus; but afterwards was unfortunate, reduced to extreme poverty, and almost abandoned. Augustus Cæsar reunited the scattered citizens, and made it a Roman colony, settling a portion of the troops which obtained the victory of Actium, with other inhabitants from the adjacent places. Patræ reflourished and enjoyed dominion over Naupactus, Oeanthé, and several cities of Achaia. In the time of Pausanias, Patræ was adorned with temples and porticoes, a theatre, and an odéum which was superior to any in Greece but that of Atticus Herodes at Athens. In the lower part of the city was a temple of Bacchus Æsymnetes, in which was an image preserved in a chest, and conveyed, it was said, from Troy by Eurypylus; who, on opening it, became disordered in his senses. By the port were temples; and by the sea, one of Ceres, with a pleasant grove and a prophetic fountain of unerring veracity in determining the event of any illness. After supplicating the goddess with incense, the sick person appeared, dead or living, in a mirror suspended so as to touch the surface of the water. In the citadel of Patræ was a temple of Diana Laphria, with her statue in the habit of a huntress of ivory and gold, given by Augustus Cæsar when he laid waste Calydon and the cities of Ætolia to people Nicopolis. The Patrensians honoured her with a yearly festival, which is described by Pausanias who

was a ſpectator. They formed a circle round the altar with pieces of green wood, each 16 cubits long, and within heaped dry fuel. The ſolemnity began with a moſt magnificent proceſſion, which was cloſed by the virgin-prieſteſs in a chariot drawn by ſtags. On the following day, the city and private perſons offered at the altar fruits, and birds, and all kinds of victims, wild-boars, ſtags, deer, young wolves, and beaſts full grown; after which the fire was kindled. He relates, that a bear and another animal forced a way through the fence, but were reconducted to the pile. It was not remembered that any wound had ever been received at this ceremony, though the ſpectacle and ſacrifice were as dangerous as ſavage. The number of women at Patræ was double that of the men. They were employed chiefly in a manufacture of flax which grew in Elis, weaving garments, and attire for the head."

PATRANA, or PASTRANA, a town of New Caſtile in Spain, with the title of a duchy. It is ſeated between the rivers Tajo and Tajuna, in W. Long. 2. 45. N. Lat. 40. 26.

PATRAS, an ancient and flouriſhing town of European Turkey, in the Morea, capital of a duchy, with a Greek archbiſhop's ſee. It is pretty large and populous; and the Jews, who are one-third part of the inhabitants, have four ſynagogues. There are ſeveral handſome moſques and Greek churches. The Jews carry on a great trade in ſilk, leather, honey, wax, and cheeſe. There are cypreſs trees of a prodigious height, and excellent pomegranates, citrons, and oranges. It has been ſeveral times taken and retaken, and it is juſt now in the hands of the Turks. It is ſeated in E. Long. 21. 45. N. Lat. 38. 17.

PATRICA, a town of Italy, in the territory of the church, and in the Campagna of Rome, towards the ſea-coaſt, and eight miles eaſt of Oſtia. About a mile from this place is a hill called *Monte de Livano*, which ſome have thought to be the ancient Lavinium founded by Æneas.

PATRES CONSCRIPTI. See CONSCRIPT and SENATOR.

PATRIARCH, PATRIARCHA, one of thoſe firſt fathers who lived towards the beginning of the world, and who became famous by their long lines of deſcendants. Abraham, Iſaac, and Jacob, and his twelve ſons, are the patriarchs of the Old Teſtament; Seth, Enoch, &c. were antediluvian patriarchs.

The authority of patriarchal government exiſted in the fathers of families, and their firſt-born after them, exerciſing all kinds of eccleſiaſtical and civil authority in their reſpective houſeholds; and to this government, which laſted till the time of the Iſraelites dwelling in Egypt, ſome have aſcribed an abſolute and deſpotic power, extending even to the puniſhment by death. In proof of this, is produced the curſe pronounced by Noah upon Canaan (Gen. ix. 25.); but it muſt be obſerved, that in this affair Noah ſeems to have acted rather as a prophet than a patriarch. Another inſtance of ſuppoſed deſpotic power is Abraham's turning Hagar and Iſhmael out of his family (Gen. xxi. 9, &c.); but this can hardly be thought to furniſh evidence of any ſingular authority veſted in the patriarchs, as ſuch, and peculiar to thoſe ages. The third inſtance brought forward to the ſame purpoſe is that of Jacob's denouncing a curſe upon Simeon and Levi (Gen. xlix. 7.), which is maintained by others to be an inſtance of prophetic inſpiration more than of patriarchal power. The fourth inſtance is that of Judah with regard to Tamar (Gen. xxxviii. 24.); with regard to which it is remarked, that Jacob, the father of Judah, was ſtill living; that Tamar was not one of his own family; and that ſhe had been guilty of adultery, the puniſhment of which was death by burning; and that Judah on this occaſion might ſpeak only as a proſecutor.

On the whole, however, it is difficult to ſay which of theſe opinions is moſt agreeable to truth. Men who believe the origin of civil government, and the obligation to obedience, to ariſe from a ſuppoſed original contract, either real or implied, will be naturally led to weaken the authority of the patriarchs: and thoſe again who eſteem government to be a divine inſtitution, will be as apt to raiſe that authority to the higheſt pitch that either reaſon or ſcripture will permit them. It cannot be denied, that authority exiſted in fathers, and deſcended to their firſt-born, in the firſt ages of the world; and it is neither unnatural nor improbable to imagine, that the idea of hereditary power and hereditary honours was firſt taken from this circumſtance. But whether authority has deſcended through father and ſon in this way to our times, is a circumſtance that cannot in one inſtance be aſſerted, and can be denied in a thouſand. The real ſource of the dignity and of the authority of modern times ſeems to have been, ſkill in the art of war, and ſucceſs in the conduct of conqueſts.

Jewiſh PATRIARCH, a dignity, reſpecting the origin of which there are a variety of opinions. The learned authors of the Univerſal Hiſtory think, that the firſt appearance and inſtitution of thoſe patriarchs happened under Nerva the ſucceſſor of Domitian. It ſeems probable that the patriarchs were of the Aaronic or Levitical race; the tribe of Judah being at that time too much depreſſed, and too obnoxious to the Romans to be able to aſſume any external power. But of whatever tribe they were, their authority came to be very conſiderable. Their principal buſineſs was to inſtruct the people; and for this purpoſe they inſtituted ſchools in ſeveral cities. And having gained great reputation for their extraordinary learning, zeal, and piety, they might, in time, not only bring a great concourſe of other Jews from other parts, as from Egypt and other weſtern provinces of their diſperſion, but likewiſe prove the means of their patriarchal authority's being acknowledged there. From them they ventured at length to levy a kind of tribute, in order to defray the charges of their dignity, and of the officers, (viz. the *Apoſtoli* or *Legati*), under them, whoſe buſineſs it was to carry their orders and deciſions through the other provinces of their diſperſion, and to ſee them punctually executed by all, that ſome ſhadow of union at leaſt might be kept up among the weſtern Jews. They likewiſe nominated the doctors who were to preſide over their ſchools and academies; and theſe were in proceſs of time ſtyled *chiefs* and *princes*, in order to raiſe the credit of that dignity, or to imply the great regard which their diſciples were to pay to them. Theſe chiefs became at length rivals of the patriarchs; and ſome of them poſſeſſed both dignities at once; an uſurpation which cauſed not only great confuſion amongſt them, but oftentimes very violent and bloody conteſts. However, as the Jewiſh Rabbies have trumped

Patriarch. trumped up a much older era for this patriarchal dignity, and have given us a fucceffion of them down to the fifth century, in which it was abolifhed, it will not be amifs to give our readers the fubftance of what they have written of the rife and progrefs of this order of men; and at the fame time to fhow them the abfurdity and falfehood of that pretended fucceffion to this imaginary dignity.

According to them, the firft patriarch was Hillel, furnamed the *Babylonian*, becaufe he was fent for from thence to Jerufalem about 100 years before the ruin of their capital, or 30 years before the birth of Chrift, to decide a difpute about the keeping of Eafter, which on that year fell out on the Sabbath day; and it was on account of his wife decifion that he was raifed to that dignity, which continued in his family till the faid fifth century. He was likewife looked upon as a fecond Mofes, becaufe he lived like him 40 years in obfcurity, 40 more in great reputation for learning and fanctity, and 40 more in poffeffion of this patriarchal dignity. They make him little inferior to that lawgiver in other of his excellencies, as well as in the great authority he gained over the whole Jewifh nation. The wonder will be, how Herod the Great, who was fo jealous of his own power, could fuffer a ftranger to be raifed to fuch a height of it, barely for having decided a difpute which muft in all likelihood have been adjudged by others long before that time.

However, Hillel was fucceeded by his fon Simeon, whom many Chriftians pretend to have been the venerable old perfon of that name, who received the divine infant in his arms. The Jews give him but a very obfcure patriarchate; though the authors above quoted make him, moreover, chief of the fanhedrim; and Epiphanius fays, that the prieftly tribe hated him fo much for giving fo ample a teftimony to the divine child, that they denied him common burial. But it is hardly credible that St Luke fhould have fo carelefsly paffed over his twofold dignity, if he had been really poffeffed of them, and have given him no higher title than that of a juft and devout man.

He was fucceeded by Jochanan, not in right of defcent, but of his extraordinary merit, which the Rabbies, according to cuftom, have raifed to fo furprifing a height, that, according to them, if the whole heavens were paper, all the trees in the world pens, and all the men writers, they would not fuffice to pen down all his leffons. He enjoyed his dignity but two years, according to fome, or five according to others: and was the perfon who, obferving the gates of the temple to open of their own accord, cried out, "O temple, temple! why art thou thus moved! We know that thou art to be deftroyed, feeing Zechariah hath foretold it, faying, "Open thy gates, O Lebanus, and let the flames confume thy cedars." Upon this he is further reported to have complimented Vefpafian, or rather, as fome have corrected the ftory, Titus, with the title of *king*, affuring him that it was a royal perfon who was to deftroy that edifice; on which account they pretend that general gave him leave to remove the fanhedrim to Japhne.

The Jewifh writers add, that he likewife erected an academy there, which fubfifted till the death of Akiba; and was likewife the feat of the patriarch; and confifted of 300 fchools, or claffes of fcholars. Another he erected at Lydda, not far from Japhne, and where the Chriftians have buried their famed St George. He lived 120 years, and being afked, what he had done to prolong his life? he gave this wife anfwer; I never made water nearer a houfe of prayer than four cubits; I never difguifed my name: I have taken care to celebrate all feftivals: and my mother hath even fold my head ornaments to buy wine enough to make me merry on fuch days; and left me at her death 300 hogfheads of it, to fanctify the Sabbath.—The doctors who flourifhed in his time were no lefs confiderable, both for their number and character; particularly the famed Rabbi Chanina, of whom the Bath Col was heard to fay, that the world was preferved for the fake of him; and R. Nicodemus, whom they pretend to have ftopped the courfe of the fun, like another Jofhua.

He was fucceeded by Gamaliel, a man, according to them, of unfufferable pride; and yet of fo univerfal authority over all the Jews, not only in the weft, but over the whole world, that the very monarchs fuffered his laws to be obeyed in their dominions, not one of them offering to obftruct the execution of them. In his days flourifhed Samuel the Lefs, who compofed a prayer full of the bittereft curfes againft heretics, by which they mean the Chriftians; and which are ftill in ufe to this day. Gamaliel was no lefs an enemy to them; and yet both have been challenged, the former as the celebrated mafter of our great apoftle, the other as his difciple in his unconverted ftate.

Simon II. his fon and fucceffor was the firft martyr who died during the fiege of Jerufalem. The people fo regretted his death, that an order was given, inftead of 10 bumpers of wine, which were ufually drank at the funeral of a faint, to drink 13 at his, on account of his martyrdom. Thefe bumpers were in time multiplied, they tell us, to fuch fhameful height, that the fanhedrim was forced to make fome new regulations to prevent that abufe.

Thefe are the patriarchs which, the Rabbies tell us, preceded the deftruction of the temple; and we need no farther confutation of this pretended dignity, than the filence of the facred hiftorians, who not only make not the leaft mention of it, but affure us all along that they were the high-priefts who prefided in the fanhedrim; and before whom all cafes relating to the Jewifh religion were brought and decided. It was the high-prieft who examined and condemned our Saviour; that condemned St Stephen; that forbade the apoftles to preach in Chrift's name; and who fat as judge on the great apoftle at the head of that fupreme court. The fame may be urged from Jofephus, who muft needs have known and mentioned this pretended dignity, if any fuch there had been; and yet is fo far from taking the leaft notice of it, that, like the evangelifts, he places the pontiffs alone at the head of all the Jewifh affairs; and names the high-prieft Ananus as having the care and direction of the war againft the Romans;—which is an evident proof that there were then no fuch patriarchs in being.

To all this let us add, that if there had been any fuch remarkable fucceffion, the Talmudifts would have preferved it to future ages; whereas, neither they, nor any of the ancient authors of the Jewifh church, make any mention of it; but only fome of their doctors, who have written a confiderable time after them, as of writers to whom little credit can be given in points of this nature;

nature; especially as there are such unsurmountable contradictions between them, as no authors either Jewish or Christian have, with all their pains, been hitherto able to reconcile.

Their succession, according to the generality of those rabbies, stands as follows:

1. Hillel the Babylonian. 2. Simeon the son of Hillel. 3. Gamaliel the son of Simeon. 4. Simeon II. the son of Gamaliel. 5. Gamaliel II. the son of Simeon II. 6. Simeon III. the son of Gamaliel II. 7. Judah the son of Simeon III. 8. Gamaliel III. the son of Judah, 9. Judah II. the son of Gamaliel III. 10. Hillel II. son of Judah II. 11. Judah III. son of Hillel II. 12. Hillel III. son of Judah III. 13. Gamaliel IV. son of Hillel III.

According to Gants Tzemach David, who hath reduced them to 10, they are

1. Hillel the Babylonian. 2. Simeon the son of Hillel. 3. Rabb. Gamaliel Rebona. 4. R. Simeon the son of Gamaliel. 5. Rabban Gamaliel his son. 6. R. Jehudah the prince. 7. Hillel the prince, his son. 8. Rabban Gamaliel the Old. 9. Simeon III. 10. R. Judah, Nassi or prince.

On the whole, it cannot be doubted but that their first rise was in Nerva's time, however much Jewish pride may have prompted them to falsify, and to assert their origin to have been more ancient than it really was. Nor have the Jews been faithful in giving an account of the authority of these men. They have exaggerated their power beyond all bounds, for the purpose of repelling the arguments of Christians: for their power was certainly more showy than substantial. In time, however, they certainly imposed upon the people; and what power they did possess (which the Romans only allowed to be in religious matters, or in such as were connected with religion) they exercised with great rigour. Their pecuniary demands, in particular, became very exorbitant; and was the cause of their suppression in the year 429.

PATRIARCHS, among Christians, are ecclesiastical dignitaries, or bishops, so called from their paternal authority in the church. The power of patriarchs was not the same in all, but differed according to the different customs of countries, or the pleasures of kings and councils. Thus the patriarch of Constantinople grew to be a patriarch over the patriarchs of Ephesus and Cæsarea, and was called the *œcumenical and universal patriarch*; and the patriarch of Alexandria had some prerogatives which no other patriarch but himself enjoyed, such as the right of consecrating and approving every single bishop under his jurisdiction.

The patriarchate has been ever esteemed the supreme dignity in the church: the bishop had only under him the territory of the city of which he was bishop; the metropolitan superintended a province, and had for suffragans the bishops of his province; the primate was the chief of what was then called a *diocese* (A), and had several metropolitans under him; and the patriarch had under him several dioceses, composing one exarchate, and the primates themselves were under him.

Usher, Pagi, De Marca, and Morinus, attribute the establishment of the grand patriarchates to the apostles themselves; who, in their opinion, according to the description of the world then given by geographers, pitched on the three principal cities in the three parts of the known world; viz. Rome in Europe, Antioch in Asia, and Alexandria in Africa: and thus formed a trinity of patriarchs. Others maintain that the name patriarch was unknown at the time of the council of Nice; and that for a long time afterwards patriarchs and primates were confounded together, as being all equally chiefs of dioceses, and equally superior to metropolitans, who were only chiefs of provinces. Hence Socrates gives the title patriarch to all the chiefs of dioceses, and reckons ten of them. Indeed, it does not appear that the dignity of patriarch was appropriated to the five grand sees of Rome, Constantinople, Alexandria, Antioch, and Jerusalem, till after the council of Chalcedon in 451; for when the council of Nice regulated the limits and prerogatives of the three patriarchs of Rome, Antioch, and Alexandria, it did not give them the title of patriarchs, though it allowed them the pre-eminence and privileges thereof; thus when the council of Constantinople adjudged the second place to the bishop of Constantinople, who till then was only a suffragan of Heraclea, it said nothing of the patriarchate. Nor is the term *patriarch* found in the decree of the council of Chalcedon, whereby the fifth place is assigned to the bishop of Jerusalem; nor did these five patriarchs govern all the churches.

There

(A) The word diocese was then of very different import from what it bears now. Under the article EPISCOPACY, it was observed, that the first founders of churches regulated their extent and the jurisdiction of their bishops by the divisions of the Roman empire into civil jurisdictions. One of these divisions was into provinces and dioceses. A province comprised the cities of a whole region subjected to the authority of one chief magistrate, who resided in the metropolis or chief city of the province. A diocese was a still larger district, comprehending within it several provinces, subject to the controul of a chief magistrate, whose residence was in the metropolis of the diocese. The jurisdiction of the bishops of the Christian church was established upon this model. The authority of a private bishop extended only over the city in which he resided, together with the adjacent villages and surrounding tract of country. This district was called παροικια, though it comprehended many parishes in the modern sense of that word. Under Arcadius and Honorius the empire was divided into thirteen dioceses: 1. The Oriental diocese, containing fifteen provinces; 2. The diocese of Egypt, six provinces; 3. The Asiatic diocese, ten provinces; 4. The Pontic diocese, ten provinces; 5. The diocese of Thrace, six provinces; 6. The diocese of Macedonia, six provinces; 7. The diocese of Decia, five provinces; 8. The Italic diocese, seventeen provinces; 9. The diocese of Illyricum, six provinces; 10. The diocese of Africa, six provinces; 11. The Spanish diocese, seven provinces; 12. The Gallican diocese, seventeen provinces; 13. The Britannic diocese, five provinces. Each of these provinces comprehended many παροικιαι, and each παροικια many modern parishes. See *Bingham's Origines Sacræ*, Book ix.

There were besides many independent chiefs of dioceses, who, far from owning the jurisdiction of the grand patriarchs, called themselves *patriarchs*; such as that of Aquileia: nor was Carthage ever subject to the patriarch of Alexandria. Mosheim * imagines that the bishops, who enjoyed a certain degree of pre-eminence over the rest of their order, were distinguished by the Jewish title of patriarchs in the fourth century. The authority of the patriarchs gradually increased, till, about the close of the fifth century, all affairs of moment within the compass of their patriarchate came before them, either at first hand or by appeals from the metropolitans. They consecrated bishops; assembled yearly in council the clergy of their respective districts; pronounced a decisive judgment in those cases where accusations were brought against bishops; and appointed vicars or deputies, clothed with their authority, for the preservation of order and tranquillity in the remoter provinces. In short, nothing was done without consulting them; and their decrees were executed with the same regularity and respect as those of the princes.

* *Eccles. Hist.* vol. i. p. 284.

It deserves to be remarked, however, that the authority of the patriarchs was not acknowledged through all the provinces without exception. Several districts, both in the eastern and western empires, were exempted from their jurisdiction. The Latin church had no patriarchs till the sixth century; and the churches of Gaul, Britain, &c. were never subject to the authority of the patriarch of Rome, whose authority only extended to the suburbicary provinces. There was no primacy, no exarchate nor patriarchate, owned here; but the bishops with the metropolitans, governed the church in common. Indeed, after the name patriarch became frequent in the west, it was attributed to the bishops of Bourges and Lyons; but it was only in the first signification, viz. as heads of dioceses. Du Cange says, that there have been some abbots who have borne the title of patriarchs.

PATRIARCHAL CROSS, in *Heraldry*, is that where the shaft is twice crossed; the lower arms being longer than the upper ones.

PATRICIAN, a title given, among the ancient Romans, to the descendants of the hundred, or, as some will have it, of the two hundred, first senators chosen by Romulus; and by him called *patres*, "fathers." Romulus established this order after the example of the Athenians; who were divided into two classes, viz. the εὐπατρίδας, *patricios*, and δημοτικους, *populares*. Patricians, therefore, were originally the nobility; in opposition to the plebeians. They were the only persons whom Romulus allowed to aspire to the magistracy; and they exercised all the functions of the priesthood till the year of Rome 495. But the cognizance and character of these ancient families being almost lost and extinguished by a long course of years, and frequent changes in the empire, a new kind of patricians were afterwards set on foot, who had no pretensions from birth, but whose title depended entirely on the emperor's favour. This new patriciate, Zozimus tells us, was erected by Constantine, who conferred the quality on his counsellors, not because they were descended from the ancient fathers of the senate, but because they were the fathers of the republic or of the empire. This dignity in time became the highest of the empire. Justinian calls it *summam dignitatem*. In effect, the patricians seem to have had the precedence of the *consulares*, and to have taken place before them in the senate; though F. Faber asserts the contrary. What confounds the question is, that the two dignities often met in the same person; because the patriciate was only conferred on those who had gone through the first offices of the empire, or had been consuls. Pope Adrian made Charlemagne take the title of patrician before he assumed the quality of emperor; and other popes have given the title to other kings and princes by reason of its eminence.

PATRICIAN is also a title of honour often conferred on men of the first quality in the time of our Anglo-Saxon kings. See THANE.

PATRICIAN Deities, *Patricii Dii*, in *Mythology*, were Janus, Saturn, the Genius, Pluto, Bacchus, the Sun, the Moon, and the Earth.

PATRICIANS, in ecclesiastical writers, were ancient sectaries, who disturbed the peace of the church in the beginning of the third century: thus called from their founder *Patricius*, preceptor of a Marcionite called *Symmachus*. His distinguishing tenet was, that the substance of the flesh is not the work of God, but that of the devil: on which account his adherents bore an implacable hatred to their own flesh; which sometimes carried them so far as to kill themselves. They were also called TATIANITES, and made a branch of the ENCRATITÆ.

PATRICK, ST, the apostle of Ireland, and second bishop of that country. He was born April 5th A. D. 373, of a good family, at Kirk Patrick near Dumbarton, in what is now called Scotland, but then comprehended under the general name of Britain.—His baptismal name *Suceath*, signifies, in the British language, "valiant in war." On some inroad of certain exiles from Ireland he was taken prisoner, and carried into that kingdom, where he continued six years in the service of Milcho, who had bought him of three others, when Patrick acquired the new name of *Cothraig*, or *Ceathar-Tigh*, i. e. *four families*. In this time he made himself master of the Irish language, and at last made his escape, and returned home on board a ship. About two years after, he formed a design of converting the Irish either in consequence of a dream, or of reflection on what he had observed during his acquaintance with them. The better to qualify himself for this undertaking, he travelled to the continent, where he continued 35 years, pursuing his studies under the direction of his mother's uncle St Martin, bishop of Tours, who had ordained him deacon; and, after his death, with St German, bishop of Auxerre, who ordained him priest, and gave him his third name *Mawn* or *Maginim*.

An ancient author, Henricus Antisiodorensis, who wrote a book concerning the miracles of St German, considers it as the highest honour of that prelate to have been the instructor of St Patrick: "As the glory of a father shines in the government of his sons; out of the many disciples in religion who are reported to have been his sons in Christ, suffice it briefly to mention one by far the most famous, as the series of his actions shows, Patrick the particular apostle of Ireland, who being under his holy discipline 18 years, derived no little knowledge in the inspired writings from such a source. The most godly divine pontiff, considering him alike distinguished in religion, eminent for virtue, and stedfast in doctrine; and thinking it absurd to let one of the best labourers

Patrick. bourers remain inactive in the Lord's vineyard, recommended him to Celestine, pope of Rome, by his presbyter Segetius, who was to carry to the apostolic see a testimonial of ecclesiastical merit of this excellent man. Approved by his judgment, supported by his authority, and confirmed by his blessing, he set out for Ireland; and being peculiarly destined to that people as their apostle, instructed them at that time by his doctrine and miracles; and now does and will forever display the wonderful power of his apostleship." Lastly, Pope Celestine consecrated him bishop, and gave him his most familiar name *Patricius*, expressive of his honourable descent; and to give lustre and weight to the commission which he now charged him with to convert the Irish. Palladius had been here a year before him on the same design, but with little success: the saints Kieran, Ailbe, Declan, and Ibar, were precursors both to Palladius and Patrick. But the great office of apostle of Ireland was reserved for our prelate, who landed in the country of the Evolein, or at Wicklow, A. D. 441. His first convert was Sinell, eighth in descent from Cormac king of Leinster; but not meeting with encouragement, he proceeded to Dublin, and thence to Ulster, where he founded a church (afterwards the famous abbey of Saul, in the county of Down), remarkable for its position, being made out of a barn, and its greatest length reaching from north to south. After labouring seven years indefatigably in his great work, he returned to Britain, which he delivered from the heresies of Pelagius and Arius; engaged several eminent persons to assist him; visited the isle of Man, which he converted in 440, when the bishopric was founded; and, A. D. 448, returned to the see of Armagh (A), which he had founded three years before; and in 13 years more completed the conversion of the whole island (B). After giving an account of his commission at Rome, he once more returned hither, and spent the remainder of his life between the monasteries of Armagh and Saul, superintending and enforcing the great plan of doctrine and discipline which he had established. After having established schools, or an academy here, he closed his life and ministry at Saul abbey, in the 120th year of his age, March 17. A. D. 493, and was buried at Down afterwards, in the same grave with St Bridget and St Columb, in the same place. Respecting his burial-place, however, there have been great disputes; and it has been as great a subject of debate with the religious, as Homer's birth-place was formerly among the cities of Greece. Those of Down lay claim to it, on the authority of the following verses:

> These three in Down lie in tomb one,
> Briget, Patricius, and Columba pious.

Those of Glastenbury in England, from the old monuments of their church: And some Scots affirm him to have been both born and buried among them at Glasgow. His genuine works were collected and printed by Sir James Ware, 1656. His immediate successor in this see was St Binen or Begnus.

Order of St PATRICK, an institution which took place in Ireland in the year 1783. On the fifth of February, in that year, the king ordered letters-patent to be passed under the great seal of the kingdom of Ireland, for creating a society or brotherhood, to be called *knights of the illustrious order of St Patrick*, of which his majesty, his heirs, and successors, shall perpetually be sovereigns, and his majesty's lieutenant-general and general-governor of Ireland, &c. for the time being, shall officiate as grand-masters; and also for appointing Prince Edward, and several of the prime nobility of Ireland, knights companions of the said illustrious order.

PATRICK, *Simon*, a very learned English bishop, was born at Gainsborough in Lincolnshire in 1626. In 1644 he was admitted into Queen's college, Cambridge, and entered into holy orders. After being for some time chaplain to Sir Walter St John, and vicar of the church at Battersea in Surrey, he was preferred to the rectory of St Paul's, Covent-garden, in London, where he continued all the time of the plague in 1665 among his parishioners, to their great comfort. In 1668 he published his Friendly Debate between a Conformist and a Nonconformist. This was answered by the Dissenters, whom he had much exasperated by it; but by his moderation and candour toward them afterwards, they were perfectly reconciled to him, and he brought over many of them to the communion of the established church. In 1678 he was made dean of Peterborough, where he was much beloved. In 1682, Dr Lewis de Moulin, who had been a history-professor at Oxford, and written many bitter books against the church of England, sent for Dr Patrick upon his sick bed, and made a solemn declaration of his regret on that account, which he signed, and it was published after his death. During the reign of King James, the dean's behaviour showed that he had nothing more at heart than the Protestant religion; for which he ventured all that was dear to him, by preaching and writing

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(A) At Armagh St Patrick founded, A. D. 445 or 447, a priory of Augustine canons, dedicated to St Peter and St Paul, much enriched by the archbishops; restored by Imar O Hedegan in the 12th century. It was granted, A. D. 1611, to Sir Toby Caulfield, knight. St Patrick also founded there a house of canonesses of the same order, under his sister Lupita, called *Templeua sirta*, or the "house of miracles."

We are told, that Armagh was made a metropolitan see in honour of St Patrick; in consequence of which it was held in the highest veneration not only by bishops and priests, but also by kings and bishops, as the venerable Bede informs us.

(B) There is a cave in the county of Donegal or Tir-connel, near the source of the Liffey, which, it is pretended, was dug by Ulysses, in order to hold conversations with infernals. The present inhabitants call it *Ellan n' Fradatory* or the "island of Purgatory, and Patrick's Purgatory." They affirm, with a pious credulity, that St Patrick the apostle of Ireland, or some abbot of that name, obtained of God by his earnest prayers, that the pains and torments which await the wicked after this life might be here set forth to view, in order the more easily to recover the Irish from their sinful state and heathenish errors.

Patrick || Patriotism.

writing against the errors of the church of Rome. In 1687 he published a prayer composed for that difficult time, when persecution was expected by all who stood firm to their religion. The year after the Revolution, the dean was appointed bishop of Chichester, and was employed with others of the new bishops to settle the affairs of the church in Ireland. In 1691 he was translated to the see of Ely, in the room of the deprived Bishop Turner. He died in 1707, after having published various works; among which the most distinguished are his Paraphrases and Commentaries on the Holy Scriptures, three volumes folio. These, with Lowth on the Proverbs, Arnold on the Apocrypha, and Whitby on the New Testament, make a regular continued commentary in English on all the sacred books.

PATRIMONY, a right or estate inherited by a person from his ancestors.

The term *patrimony* has been also given to church-estates or revenues; in which sense authors still say, the patrimony of the church of Rimini, Milan, &c. The church of Rome hath patrimonies in France, Africa, Sicily, and many other countries. To create the greater respect to the estates belonging to the church, it was usual to give their patrimonies the names of the saints they held in the highest veneration: thus the estate of the church of Ravenna was called the *patrimony of St Apollinarius;* that of Milan, the *patrimony of St Ambrose;* and the estates of the Roman church were called the *patrimony of St Peter in Abruzzo*, the *patrimony of St Peter in Sicily*, and the like.

What is now called *St Peter's patrimony* is only the duchy of Castro, and the territory of Orvietto. See CASTRO, &c.

PATRIOTISM, a love of one's country, which is one of the noblest passions that can warm and animate the human breast. It includes all the limited and particular affections to our parents, children, friends, neighbours, fellow-citizens, and countrymen. It ought to direct and limit their more confined and partial actions within their proper and natural bounds, and never let them encroach on those sacred and first regards we owe to the great public to which we belong. Were we solitary creatures, detached from the rest of mankind, and without any capacity of comprehending a public interest, or without affections leading us to desire and pursue it, it would not be our duty to mind it, nor criminal to neglect it. But as we are parts of the public system, and are not only capable of taking in large views of its interests, but by the strongest affections connected with it, and prompted to take a share of its concerns, we are under the most sacred ties to prosecute its security and welfare with the utmost ardour, especially in times of public trial.

"Zeal for the public good (says Mr Addison) is the characteristic of a man of honour and a gentleman, and must take place of pleasures, profits, and all other private gratifications: that whosoever wants this motive, is an open enemy, or an inglorious neuter to mankind, in proportion to the misapplied advantages with which nature and fortune have blessed him." This love of our country does not import an attachment to any particular soil, climate, or spot of earth, where perhaps we first drew our breath, though those natural ideas are often associated with the moral ones; and, like external signs or symbols, help to ascertain and bind them; but it imports an affection to that moral system or community, which is governed by the same laws and magistrates, and whose several parts are variously connected one with the other, and all united upon the bottom of a common interest. Wherever this love of our country prevails in its genuine vigour and extent, it swallows up all sordid and selfish regards; it conquers the love of ease, power, pleasure, and wealth; nay, when the amiable partialities of friendship, gratitude, private affection, or regards to a family, come in competition with it, it will teach us to sacrifice all, in order to maintain the rights, and promote and defend the honour and happiness of our country. To pursue, therefore, our private interests in subordination to the good of our country; to be examples in it of virtue, and obedient to the laws; to choose such representatives as we apprehend to be the best friends to its constitution and liberties; and if we have the power, to promote such laws as may improve and perfect it; readily to embrace every opportunity for advancing its prosperity; cheerfully to contribute to its defence and support; and, if need be, to die for it:—these are among the duties which every man, who has the happiness to be a member of our free and Protestant constitution, owes to his country.

The constitution of man is such, that the most selfish passions, if kept within their proper bounds, have a tendency to promote the public good. There is no passion of more general utility than patriotism; but its origin may unquestionably be termed *selfish*. The love of one's relations and friends is the most natural expansion of self-love: this affection connects itself too with local circumstances, and sometimes cannot easily be separated from them. It often varies, as relationship or place varies; but acquires new power when the whole community becomes its object. It was therefore with singular propriety that the poet said, "Self love and social are the same." Under the article CALAIS we have already given the outlines of the transactions of its siege by Edward III. during which the inhabitants displayed a degree of *patriotism* truly wonderful. History scarcely affords a more distinguished instance of true patriotic virtue than on this occasion. We shall therefore give a fuller account of this remarkable affair, as one of the best examples that can possibly be selected of the virtue we have been explaining. The inhabitants, under Count Vienne their gallant governor, made an admirable defence against a well disciplined and powerful army. Day after day the English effected many a breach, which they repeatedly expected to storm by morning; but, when morning appeared, they wondered to behold new ramparts raised nightly, erected out of the ruins which the day had made. France had now put the sickle into her second harvest since Edward with his victorious army sat down before the town. The eyes of all Europe were intent on the issue. The English made their approaches and attacks without remission; but the citizens were as obstinate in repelling all their efforts. At length, famine did more for Edward than arms. After the citizens had devoured the lean carcases of their half-starved cattle, they tore up old foundations and rubbish in search of vermin: they fed on boiled leather, and the weeds of exhausted gardens; and a morsel of damaged corn was accounted matter of luxury.

Rapin's Hist. Eng. Edw. III.

Patriotiſm.

luxury. In this extremity they reſolved to attempt the enemy's camp. They boldly ſallied forth; the Engliſh joined battle; and, after a long and deſperate engagement, Count Vienne was taken priſoner; and the citizens, who ſurvived the ſlaughter, retired within their gates. On the captivity of their governor, the command devolved upon Euſtace Saint Pierre, the mayor of the town, a man of mean birth, but of exalted virtue. Euſtace ſoon found himſelf under the neceſſity of capitulating, and offered to deliver to Edward the city, with all the poſſeſſions and wealth of the inhabitants, provided he permitted them to depart with life and liberty. As Edward had long ſince expected to aſcend the throne of France, he was exaſperated to the laſt degree againſt theſe people, whoſe ſole valour had defeated his warmeſt hopes; he therefore determined to take an exemplary revenge, though he wiſhed to avoid the imputation of cruelty. He anſwered by Sir Walter Mauny, that they all deſerved capital puniſhment, as obſtinate traitors to him, their true and notable ſovereign; that, however, in his wonted clemency, he conſented to pardon the bulk of the plebeians, provided they would deliver up to him ſix of their principal citizens with halters about their necks, as victims of due atonement for that ſpirit of rebellion with which they had inflamed the common people. All the remains of this deſolate city were convened in the great ſquare; and like men arraigned at a tribunal from whence there was no appeal, expected with throbbing hearts the ſentence of their conqueror. When Sir Walter had declared his meſſage, conſternation and pale diſmay was impreſſed on every face: each looked upon death as his own inevitable lot; for how ſhould they deſire to be ſaved at the price propoſed? Whom had they to deliver up, ſave parents, brothers, kindred, or valiant neighbours, who had ſo often expoſed their lives in their defence? To a long and dead ſilence, deep ſighs and groans ſucceeded, till Euſtace Saint Pierre aſcending a little eminence, thus addreſſed the aſſembly: "My friends and fellow-citizens, you ſee the condition to which we are reduced; we muſt either ſubmit to the terms of our cruel and enſnaring conqueror, or yield up our tender infants, our wives, and chaſte daughters, to the bloody and brutal luſts of the violating ſoldiery. We well know what the tyrant intends by his ſpecious offers of mercy. It does not ſatiate his vengeance to make us merely miſerable, he would alſo make us criminal: he would make us contemptible: he will grant us life on no condition, ſave that of our being unworthy of it. Look about you, my friends, and fix your eyes on the perſons whom you wiſh to deliver up as the victims of your own ſafety. Which of theſe would you appoint to the rack, the axe, or the halter? Is there any here who has not watched for you, who has not fought for you, who has not bled for you? Who, through the length of this inveterate ſiege, has not ſuffered fatigues and miſeries a thouſand times worſe than death, that you and yours might ſurvive to days of peace and proſperity? Is it your preſervers, then, whom you would deſtine to deſtruction? You will not, you cannot, do it. Juſtice, honour, humanity, make ſuch a treaſon impoſſible. Where then is our reſource? Is there any expedient left, whereby we may avoid guilt and infamy on one hand, or the deſolation and horrors of a ſacked city on the other? There is, my friends, there is one expedient left; a gracious, an excellent, a god-like expedient! Is there any here to whom virtue is dearer than life! Let him offer himſelf an oblation for the ſafety of his people! he ſhall not fail of a bleſſed approbation from that power, who offered up his only Son for the ſalvation of mankind." He ſpoke—but an univerſal ſilence enſued. Each man looked round for the example of that virtue and magnanimity in others, which all wiſhed to approve in themſelves, though they wanted the reſolution. At length Saint Pierre reſumed: "It had been baſe in me, my fellow-citizens, to promote any matter of damage to others, which I myſelf had not been willing to undergo in my own perſon. But I held it ungenerous to deprive any man of that preference and eſtimation, which might attend a firſt offer on ſo ſignal an occaſion: for I doubt not but there are many here as ready, nay, more zealous for this martyrdom than I can be, however modeſty and the fear of imputed oſtentation may withhold them from being foremoſt in exhibiting their merits. Indeed the ſtation to which the captivity of Count Vienne has unhappily raiſed me, imports a right to be the firſt in giving my life for your ſakes. I give it freely, I give it cheerfully. Who comes next? Your ſon! exclaimed a youth, not yet come to maturity.—Ah, my child! cried St Pierre; I am then twice ſacrificed.—But no—I have rather begotten thee a ſecond time.—Thy years are few, but full, my ſon; the victim of virtue has reached the utmoſt purpoſe and goal of mortality. Who next, my friends? This is the hour of heroes.—Your kinſman, cried John de Aire! Your kinſman, cried James Wiſſant! Your kinſman, cried Peter Wiſſant!—"Ah! (exclaimed Sir Walter Mauny, burſting into tears), why was I not a citizen of Calais?" The ſixth victim was ſtill wanting, but was quickly ſupplied by lot, from numbers who were now emulous of ſo ennobling an example. The keys of the city were then delivered to Sir Walter. He took the ſix priſoners into his cuſtody. He ordered the gates to be opened, and gave charge to his attendants to conduct the remaining citizens with their families through the camp of the Engliſh. Before they departed, however, they deſired permiſſion to take their laſt adieu of their deliverers.—What a parting! what a ſcene! they crowded with their wives and children about St Pierre and his fellow-priſoners. They embraced, they clung around, they fell proſtrate before them. They groaned; they wept aloud; and the joint clamour of their mourning paſſed the gates of the city, and was heard throughout the camp. At length Saint Pierre and his fellow victims appeared under the conduct of Sir Walter and his guard. All the tents of the Engliſh were inſtantly emptied. The ſoldiers poured from all parts, and arranged themſelves on each ſide to behold, to contemplate, to admire this little band of patriots as they paſſed. They murmured their applauſe of that virtue which they could not but revere even in enemies; and they regarded thoſe ropes which they had voluntarily aſſumed about their necks as enſigns of greater dignity than that of the Britiſh Garter. As ſoon as they had reached the royal preſence, "Mauny (ſays the king), are theſe the principal inhabitants of Calais?" "They are (ſays Mauny); they are not only the principal men of Calais, they are the principal men of France, my lord, if

Patriotism. if virtue has any share in the act of ennobling." "Were they delivered peaceably, (says Edward)? Was there no resistance, no commotion among the people?" "Not in the least, my lord. They are self-delivered, self-devoted, and come to offer up their inestimable heads as an ample equivalent for the ransom of thousands."

The king, who was highly incensed at the length and difficulty of the siege, ordered them to be carried away to immediate execution; nor could all the remonstrances and intreaties of his courtiers divert him from his cruel purpose. But what neither a regard to his own interest and honour, what neither the dictates of justice, nor the feelings of humanity, could effect, was happily accomplished by the more powerful influence of conjugal affection. The queen, who was then big with child, being informed of the particulars respecting the six victims, flew into her husband's presence, threw herself on her knees before him, and, with tears in her eyes, besought him not to stain his character with an indelible mark of infamy, by committing such a horrid and barbarous deed. Edward could refuse nothing to a wife whom he so tenderly loved, and especially in her condition; and the queen, not satisfied with having saved the lives of the six burghers, conducted them to her tent, where she applauded their virtue, regaled them with a plentiful repast, and having made them a present of money and clothes, sent them back to their fellow-citizens.

The love of their country, and of the public good, seems to have been the predominant passion of the Spartans. Pedaretus having missed the honour of being chosen one of the three hundred who had a certain rank of distinction in the city, went home extremely pleased and satisfied; saying, "He was overjoyed there were three hundred men in Sparta more honourable than himself."

Plutarch's Life of Lycurgus.

The patriotism of the Romans is well known, and has been justly admired. We shall content ourselves at present with the following example; a zeal and patriotic devotion similar to which is perhaps scarcely equalled, and certainly is not exceeded, in history.

Dion, lib. viii. p. 570. and *Rollin's Rom. Hist.* v. i. p. 366.

Rome, under the consuls Cæso Fabius and T. Virginius, had several wars to sustain, less dangerous than troublesome, against the Æqui, Volsci, and Veientes. To put a stop to the incursions of the last, it would have been necessary to have established a good garrison upon their frontiers to keep them in awe. But the commonwealth, exhausted of money, and menaced by abundance of other enemies, was not in a condition to provide for so many different cares and expences. The family of the Fabii showed a generosity and love of their country that has been the admiration of all ages. They applied to the senate, and by the mouth of the consul demanded as a favour that they would be pleased to transfer the care and expences of the garrison necessary to oppose the enterprises of the Veientes to their house, which required an assiduous rather than a numerous body, promising to support with dignity the honour of the Roman name in that post. Every body was charmed with so noble and unheard of an offer; and it was accepted with great acknowledgment. The news spread over the whole city, and nothing was talked of but the Fabii. Every body praised, every body admired and extolled them to the skies. "If there were two more such families in Rome," said they, "the one might take upon them the war against the Volsci, and the other against the Æqui, whilst the commonwealth remained quiet, and the forces of particulars subdued the neighbouring states."

Early the next day the Fabii set out, with the consul at their head, robed, and with his insignia. Never was there so small, and at the same time so illustrious, an army seen; for which we have the authority of Livy. Three hundred and six soldiers, all patricians, and of the same family, of whom not one but might be judged worthy of commanding an army, march against the Veii full of courage and alacrity, under a captain of their own name, Fabius. They were followed by a body of their friends and clients, animated by the same spirit and zeal, and actuated only by great and noble views. The whole city flocked to see so fine a sight; praised those generous soldiers in the highest terms; and promised them consulships, triumphs, and the most glorious rewards. As they passed before the capitol and the other temples, every body implored the gods to take them into their protection; to favour their departure and undertaking, and to afford them a speedy and happy return. But those prayers were not heard. When they arrived near the river Crimera, which is not far from Veii, they built a fort upon a very rough and steep mountain for the security of the troops, which they surrounded with a double fosse, and flanked with several towers. This settlement, which prevented the enemy from cultivating their ground and ruined their commerce with strangers, incommoded them extremely. The Veientes not finding themselves strong enough to ruin the fort which the Romans had erected, applied to the Hetrurians, who sent them very considerable aid. In the mean time the Fabii, encouraged by the great success of their incursions into the enemy's country, made farther progress every day. Their excessive boldness made the Hetrurians conceive thoughts of laying ambuscades for them in several places. During the night they seized all the eminences that commanded the plain, and found means to conceal a great number of troops upon them. The next day they dispersed more cattle about the country than they had done before. The Fabii being apprized that the plains were covered with flocks and herds, and defended by only a very small number of troops, they quitted their fort, leaving in it only a sufficient number to guard it. The hopes of a great booty quickened their march. They arrived at the place in order of battle; and were preparing to attack the advanced guard of the enemy, when the latter, who had their orders, fled without staying till they were charged. The Fabii, believing themselves secure, seized the shepherds, and were preparing to drive away the cattle. The Hetrurians then quitted their skulking places, and fell upon the Romans from all sides, who were most of them dispersed in pursuit of their prey. All they could do was to rally immediately; and that they could not effect without great difficulty. They soon saw themselves surrounded on all sides, and fought like lions, selling their lives very dear. But finding that they could not sustain this kind of combat long, they drew up in a wedge, and advancing with the utmost fury and impetuosity, opened themselves a passage through the enemy that led to the side of the mountain. When they came thither, they halted, and fought

fought with freſh courage, the enemy leaving them no time to reſpire. As they were upon the higher ground, they defended themſelves with advantage, notwithſtanding their ſmall number; and beating down the enemy, who ſpared no pains in the attack, they made a great ſlaughter of them. But the Veientes having gained the top of the mountain by taking a compaſs, fell ſuddenly upon them, and galled them exceedingly from above with a continual ſhower of darts. The Fabii defended themſelves to their laſt breath, and were all killed to a man. The Roman people were highly affected with the loſs of this illuſtrious band of patriots. The day of their defeat was ranked amongſt the unfortunate days, called *nefaſti*, on which the tribunals were ſhut up, and no public affair could be negociated, or at leaſt concluded. The memory of theſe public-ſpirited patricians, who had ſo generouſly ſacrificed their lives and fortunes for the ſervice of the ſtate, could not be too much honoured.

PATRIPASSIANS, PATRIPASSIANI, in church hiſtory, a Chriſtian ſect, who appeared about the latter end of the ſecond century; ſo called from their aſcribing the paſſion to the Father; for they aſſerted the unity of God in ſuch a manner as to deſtroy all diſtinctions of perſons, and to make the Father and Son preciſely the ſame; in which they were followed by the Sabellians and others. The author and head of the Patripaſſians was Praxeas, a philoſopher of Phrygia in Aſia. Swedenbourg and his followers ſeem to hold the ſame faith.

PATROCLUS, a Grecian chief at the Trojan war. He was the ſon of Menœtius, by Sthenele, whom ſome call *Philomela* or *Polymela*. The murder of Clyſonymus, the ſon of Amphidamas, by accident, in the time of his youth, made him fly from Opus, where his father reigned. He went to the court of Peleus king of Phthia. He was cordially received, and contracted the moſt intimate friendſhip with Achilles the king's ſon. When the Greeks went to the Trojan war, Patroclus went with them at the expreſs deſire of his father, who had viſited the court of Peleus; and he accordingly embarked with ten ſhips from Phthia. He was the conſtant companion of Achilles; lodged in the ſame tent; and, when he refuſed to appear in the field of battle, becauſe he had been offended by Agamemnon, Patroclus imitated his example, and by his abſence was the cauſe of much evil to the Greeks. At laſt, however, Neſtor prevailed upon him to return to the war, and Achilles permitted him to appear in his armour. The bravery of Patroclus, together with the terror which the ſight of the arms of Achilles inſpired, ſoon routed the victorious armies of the Trojans, and obliged them to fly to the city for ſafety. He would have broken down the walls; but Apollo, who intereſted himſelf for the Trojans, oppoſed him; and Hector, at the inſtigation of that god, diſmounted from his chariot to attack him as he attempted to ſtrip one of the Trojans whom he had ſlain. This engagement was obſtinate; but Patroclus was at length overpowered by the valour of Hector, and the interpoſition of Apollo. His arms became the property of the conqueror; and Hector would have ſevered his head from his body had not Ajax and Menelaus prevented it. His body was at laſt recovered, and carried to the Grecian camp, where Achilles received it with the

loudeſt lamentations. His funerals were obſerved with the greateſt ſolemnity. Achilles ſacrificed near the burning pile twelve young Trojans, four of his horſes, and two of his dogs; and the whole was concluded by the exhibition of funeral games, in which the conquerors were liberally rewarded by Achilles. The death of Patroclus, as deſcribed by Homer, gave riſe to new events. Achilles forgot his reſentment againſt Agamemnon, and entered the field to avenge the fall of his friend; and his anger was gratified only by the ſlaughter of Hector, who had more powerfully kindled his wrath by appearing at the head of the Trojan armies in the armour which had been taken from the body of Patroclus. The patronymic of Actorides is often applied to Patroclus, becauſe Actor was father to Menœtius.

PATROL, in war, a round or march made by the guards or watch in the night time, to obſerve what paſſes in the ſtreets, and to ſecure the peace and tranquillity of a city or camp. The patrol generally conſiſts of a body of five or ſix men, detached from a body on guard, and commanded by a ſerjeant.

They go every hour of the night, from the beating of the tattoo until the reveille: they are to walk in the ſtreets in garriſons, and all over the camp in the field, to prevent diſorders, or any number of people from aſſembling together: they are to ſee the lights in the ſoldiers barracks put out, and to take up all the ſoldiers they find out of their quarters. Sometimes patrols conſiſt of an officer and 30 or 40 men, as well infantry as cavalry; but then the enemy is generally near at hand, and conſequently the danger the greater.

PATRON, among the Romans, was an appellation given to a maſter who had freed his ſlave. As ſoon as the relation of maſter expired, that of patron began: for the Romans, in giving their ſlaves their freedom, did not deſpoil themſelves of all rights and privileges in them; the law ſtill ſubjected them to conſiderable ſervices and duties towards their patrons, the neglect of which was very ſeverely puniſhed.

Patron was alſo a name which the people of Rome gave to ſome great man, under whoſe protection they uſually put themſelves; paying him all kinds of honour and reſpect, and denominating themſelves his clients; while the patron, on his ſide, granted them his credit and protection. They were therefore mutually attached and mutually obliged to each other; and by this means, in conſequence of reciprocal ties, all thoſe ſeditions, jealouſies, and animoſities, which are ſometimes the effect of a difference of rank, were prudently avoided: for it was the duty of the patron to adviſe his clients in points of law, to manage their ſuits, to take care of them as of his own children, and ſecure their peace and happineſs. The clients were to aſſiſt their patrons with money on ſeveral occaſions; to ranſom them or their children when taken in war; to contribute to the portions of their daughters; and to defray, in part, the charges of their public employments. They were never to accuſe each other, or take contrary ſides; and if either of them was convicted of having violated this law, the crime was equal to that of treaſon, and any one was allowed to kill the offender with impunity. This patronage was a tie as effectual as any conſanguinity or alliance, and had a wonderful effect towards maintaining union and concord among the people for the

Patron, Patronage. the space of 600 years; during which time we find no dissensions or jealousies between the patrons and their clients, even in the times of the republic, when the populace frequently mutinied against those who were most powerful in the city.

PATRON, in the church of Rome, a saint whose name a person bears, or under whose protection he is put, and whom he takes particular care to invoke; or a saint in whose name a church or order is founded.

PATRON, in the canon or common law, is a person who, having the advowson of a parsonage, vicarage, or the like spiritual promotion, belonging to his manor, hath on that account the gift and disposition of the benefice, and may present to it whenever it becomes vacant. The patron's right of disposing of a benefice originally arises either from the patron or his ancestors, &c. being the founders or builders of the church; from their having given lands for the maintenance thereof; or from the church's being built on their ground; and frequently from all three together.

PATRONAGE, or ADVOWSON, a sort of incorporeal hereditament, consisting in the right of presentation to a church or ecclesiastical benefice. Advowson, *advocatio*, signifies *in clientelam recipere*, the taking into protection; and therefore is synonymous with patronage, *patronatus*: and he who has the right of advowson is called the *patron of the church*. For when lords of manors first built churches on their own demesnes, and appointed the tithes of those manors to be paid to the officiating ministers, which before were given to the clergy in common (from whence arose the division of parishes), the lord who thus built a church, and endowed it with a glebe or land, had of common right a power annexed of nominating such minister as he pleased (provided he were canonically qualified) to officiate in that church, of which he was the founder, endower, maintainer, or, in one word, the patron.

Blackst. Comment.

Advowsons are either advowsons *appendant*, or advowsons *in gross*. Lords of manors being originally the only founders, and of course the only patrons, of churches, the right of patronage or presentation, so long as it continues annexed to the possession of the manor, as some have done from the foundation of the church to this day, is called an *advowson appendant*: and it will pass, or be conveyed, together with the manor, as incident and appendant thereto, by a grant of the manor only, without adding any other words. But where the property of the advowson has been once separated from the property of the manor by legal conveyance, it is called an *advowson in gross*, or at large, and never can be appendant any more; but it is for the future annexed to the person of its owner, and not to his manor or lands.

Advowsons are also either *presentative*, *collative*, or *donative*. An advowson presentative, is where the patron hath a right of presentation to the bishop or ordinary, and moreover to demand of him to institute his clerk if he finds him canonically qualified: and this is the most usual advowson. An advowson collative, is where the bishop and patron are one and the same person: in which case the bishop cannot present to himself; but he does, by the one act of collation, or conferring the benefice, the whole that is done in common cases, by both presentation and institution. An advowson donative, is when the king, or any subject by his licence, doth found a church or chapel, and ordains that it shall be merely in the gift or disposal of the patron; subject to his visitation only, and not to that of the ordinary; and vested absolutely in the clerk by the patron's deed of donation, without presentation, institution, or induction. This is said to have been anciently the only way of conferring ecclesiastical benefices in England; the method of institution by the bishop not being established more early than the time of Archbishop Becket in the reign of Henry II. and therefore, though Pope Alexander III. in a letter to Becket, severely inveighs against the *prava consuetudo*, as he calls it, of investiture conferred by the patron only, this however shows what was then the common usage. Others contend that the claim of the bishops to institution is as old as the first planting of Christianity in this island; and in proof of it they allege a letter from the English nobility to the pope in the reign of Henry the Third, recorded by Matthew Paris, which speaks of presentation to the bishop as a thing immemorial. The truth seems to be, that, where the benefice was to be conferred on a mere layman, he was first presented to the bishop in order to receive ordination, who was at liberty to examine and refuse him: but where the clerk was already in orders, the living was usually vested in him by the sole donation of the patron; till about the middle of the 12th century, when the pope and his bishops endeavoured to introduce a kind of feodal dominion over ecclesiastical benefices, and, in consequence of that, began to claim and exercise the right of institution universally, as a species of spiritual investiture.

Patronage, Patronymic.

However this may be, if, as the law now stands, the true patron once waves this privilege of donation, and presents to the bishop, and his clerk is admitted and instituted, the advowson is now become for every presentative, and shall never be donative any more. For these exceptions to general rules and common right are ever looked upon by the law in an unfavourable view, and construed as strictly as possible. If therefore the patron, in whom such peculiar right resides, does once give up that right, the law, which loves uniformity, will interpret it to be done with an intention of giving it up for ever; and will therefore reduce it to the standard of other ecclesiastical livings. See further, LAW, Part III. Sect. v. N° clix. 5—10.

Arms of PATRONAGE, in *Heraldry*, are those on the top of which are some marks of subjection and dependence: thus the city of Paris lately bore the fleurs-de-lis in chief, to show her subjection to the king; and the cardinals, on the top of their arms, bear those of the pope, who gave them the hat, to show that they are his creatures.

PATRONYMIC, among grammarians, is applied to such names of men or women as are derived from those of parents or ancestors.

Patronymics are derived, 1. From the father; as Pelides, *i. e.* Achilles the son of Peleus. 2. From the mother; as Philyrides, *i. e.* Chiron the son of Philyra. 3. From the grandfather on the father's side; as Æacides, *i. e.* Achilles the grandson of Æacus. 4. From the grandfather by the mother's side; as Atlantiades, *i. e.* Mercury the grandson of Atlas. And, 5. From the kings and founders of nations; as Romulidæ, *i. e.* the Romans, from their founder King Romulus.

The terminations of Greek and Latin patronymics

Patronymic || Pattans. are chiefly four, viz. *des*, of which we have examples above; *as*, as Thaumantias, *i. e.* Iris the daughter of Thaumas; *is*, as Atlantis, *i. e.* Electra the daughter of Atlas; and *ne*, as Nerine, the daughter of Nereus. Of these terminations *des* is masculine; and *as*, *is*, and *ne*, feminine; *des* and *ne* are of the first declension, *as* and *is* of the third.

The Russians, in their usual mode of address, never prefix any title or appellation of respect to their names; but persons of all ranks, even those of the first distinction, call each other by their Christian names, to which they add a patronymic. These patronymics are formed in some cases by adding Vitch (the same as our Fitz, as Fitzherbert, or the son of Herbert) to the Christian name of the father; in others by Of or Ef; the former is applied only to persons of condition, the latter to those of inferior rank. Thus,

Ivan Ivanovitch, Ivan Ivanof, is Ivan the son of Ivan: Peter Alexievitch, Peter Alexeof, Peter the son of Alexey.

The female patronymic is Efna or Ofna, as Sophia Alexeefna, or Sophia the daughter of Alexey; Maria Ivanofna, or Maria the daughter of Ivan.

Great families are also in general distinguished by a surname, as those of Romanof, Galitzin, Sheremetof, &c.

PATROS, mentioned by Jeremiah and Ezekiel, appears from the context to be meant of a part of Egypt. Bochart thinks it denotes the Higher Egypt; the Septuagint translate it the country of *Pathure*; in Pliny we have the *Nomos Pathurites* in the Thebais; in Ptolemy, *Pathyris*, probably the metropolis. From the Hebrew appellation *Patros* comes the gentilitious name *Pathrusim*, (Moses).

PATTANS, PATANS, or AFGHANS, a very warlike race of men, who had been subjects of the vast empire of Bochara. They revolted under their governor Abstagi, in the 10th century, and laid the foundation of the empire of Ghizni or Gazna. In the Dissertation prefixed to vol. iii. of Dow's History, we have this account of the Pattans.

"They are divided into distinct communities, each of which is governed by a prince, who is considered by his subjects as the chief of their blood, as well as their sovereign. They obey him without reluctance, as they derive credit to their family by his greatness. They attend him in his wars with the attachment which children have to a parent; and his government, though severe, partakes more of the rigid discipline of a general than the caprice of a despot. Rude, like the face of their country, and fierce and wild as the storms which cover their mountains, they are addicted to incursions and depredations, and delight in battle and in plunder. United firmly to their friends in war, to their enemies faithless and cruel, they place justice in force, and conceal treachery under the name of address."

The empire, which took its rise from the revolt of the Pattans, under a succession of warlike princes rose to a surprising magnitude. In the beginning of the 11th century, it extended from Ispahan to Bengal, and from the mouths of the Indus to the banks of the Jaxertes, which comprehends at least half of the continent of Asia. They had fled to the mountains on the borders of Persia, that they might escape the sword, or avoid submitting to the conquerors of India; and there they formed their state, which the Moguls were never able thoroughly to subdue. Indeed they sometimes exercised depredations on the adjacent countries; nor was it possible for the Moguls either to prevent it or to extirpate them. They were sensible that the climate and soil of the delicious plains would only serve to rob them of that hardiness they contracted in the hills to which they were confined; they, therefore, for a long time gave no indications of a desire to exchange them for more pleasing abodes, or a more accessible situation. This enabled them to brave the victorious army of Nadir Shah, whose troops they quietly suffered to penetrate into Hindostan, and waited his return with the spoils of that country.—They then harassed his army in the straits and defiles of the mountains, and proved themselves such absolute masters of the passes, that they forced him to purchase from them his passage into Persia. Pattans, Pau.

In the beginning of the 18th century, they had spread themselves over the adjoining province of Kandahar; and such was the imbecility of the Persian empire at that time, that many other provinces and tributary states were also induced to revolt. When the king or shah of that time, whose name was *Hussein*, opposed the growing power of this warlike people, he was totally defeated, and Ispahan was besieged and obliged to surrender, after having suffered dreadful calamities, to an army consisting of only 30,000 men. In consequence of this, they brought about a revolution in Persia, and subjected it to themselves. This sovereignty, however, they only held for seven years and 21 days, having fallen a sacrifice to the enterprising spirit of Kouli Khan, or Nadir Shah. See PERSIA and AFGHANS.

PAU, a town of France, in the province of Gascony and territory of Bearne, having formerly a parliament, a mint, and a castle. "The city of Pau (says Wraxal *) will be for ever memorable in history, since it was the birthplace of Henry IV. That immortal prince was born in the castle, then the usual residence of the kings of Navarre. It stands on one of the most romantic and singular spots I have ever seen, at the west end of the town, upon the brow of a rock which terminates perpendicularly. Below runs the Gave, a river or rather a torrent which rises in the Pyrenees, and empties itself into the Adour. On the other side, about two miles off, is a ridge of hills covered with vineyards, which produce the famous *Vin de Jorençon*, so much admired; and beyond all, at the distance of nine leagues, appear the Pyrenees themselves, covering the horizon from east to west, and bounding the prospect. The castle, though now in a state of decay, is still habitable; and the apartments are hung with tapestry, said to be the work of Jane queen of Navarre, and mother of Henry IV. Gaston IV. count de Foix, who married Leonora heiress of the crown of Navarre, began the edifice in 1464; but his successor Henry d'Albret completed and enlarged it about the year 1519, when he made choice of the city of Pau for his residence, and where, during the remainder of his reign, he held his little court. In a chamber, which by its size was formerly a room of state, is a fine whole length portrait of that Jane queen of Navarre whom I have just mentioned. Her dress is very splendid, and resembles those in which our Elizabeth is usually painted. Her head-dress is adorned with pearls; round her neck she wears a ruff; and her arms, which are likewise covered with pearls, are concealed by her habit

* *Tour through France.*

Pau, Pavan.

habit quite down to the wrist. At her waist hangs by a chain a miniature portrait. The fingers of her right hand play on the strings of a guitar; and in her left she holds an embroidered handkerchief. The painter has drawn her as young, yet not in the first bloom of youth. Her features are regular, her countenance thin, but rather inclining to long; the eyes hazel, and the eyebrows finely arched. Her nose is well formed, though large, and her mouth pretty. She was a great princess, of high spirit, and undaunted magnanimity. Her memory is not revered by the French historians, because she was the protectress of the Huguenots and the friend of Coligni; but the actions of her life evince her distinguished merit.

"In one of the adjoining chambers, is another portrait of Henry IV. himself when a boy; and on the second floor is the apartment in which he was born. The particulars of his birth are in themselves so curious, and and as relating to so great and good a prince, are so peculiarly interesting, that I doubt not you will forgive my enumerating them, even though you should have seen them elsewhere.—His mother Jane had already lost two sons, the duke de Beaumont and the count de Marle. Henry d'Albret, her father, anxious to see an heir to his dominions, enjoined her (when she accompanied her husband Anthony of Bourbon to the wars of Picardy against the Spaniards), if she proved with child, to return to Pau, and to ly-in there, as he would himself superintend the education of the infant from the moment of its birth. He threatened to disinherit her if she failed to comply with this injunction. The princess, in obedience to the king's command, being in the ninth month of her pregnancy, quitted Compiegne in the end of November, traversed all France in 15 days, and arrived at Pau, where she was delivered of a son on the 13th December 1553. She had always been desirous to see her father's will, which he kept in a golden box; and he promised to show it to her, provided she admitted of his being present at her delivery, and would, during the pains of her labour, sing a song in the Bearnois language. Jane had courage enough to perform this unusual request; and the king being called on the first news of her illness, she immediately sung a Bearnois song, beginning, 'Notre Dame du bout du pont, aidez moi en cette heure.'—As she finished it, * Henry was born. The king instantly performed his promise, by giving her the box, together with a golden chain, which he tied about her neck; and taking the infant into his own apartment, began by making him swallow some drops of wine, and rubbing his lips with a root of garlic. They still show a tortoise-shell which served him for a cradle, and is preserved on that account. Several of the ancient sovereigns of Navarre resided and died in the castle of Pau. François Phœbus, who ascended the throne in 1479, died here in 1483."

* See Hen. IV. King of France.

Pau is a handsome city, well built, and contains near 6000 inhabitants. It is a modern place, having owed its existence entirely to the castle, and to the residence of the kings of Navarre. W. Long. 0. 4. N. Lat. 43. 15.

PAVAN, or PAVANE, a grave dance used among the Spaniards, and borrowed from them; wherein the performers made a kind of wheel or tail before each other, like that of *pavo*, "a peacock;" from whence the name is derived. The pavane was formerly in great repute, and was danced by gentlemen with cap and sword; by those of the long robe in their gowns, by princes with their mantles, and by the ladies with their gown tails trailing on the ground. It was called the *grand ball*, from the solemnity with which it was performed. To moderate its gravity, it was usual to introduce several flourishes, passades, capers, &c. by way of episodes. Its tablature or score is given at large by Thoinot Arbeau in his Orchesographia.

Pavan ‖ Pavilion.

PAVETTA, a genus of plants belonging to the tetrandria class; and in the natural method ranking under the 47th order, *Stellatæ*. See BOTANY *Index*.

PAVIA, an ancient and celebrated town of Italy, in the duchy of Milan, and capital of the Pavesan, with an university and bishop's see. It was anciently called *Ticinum*, from its situation on that river, and lies 20 miles to the southward of Milan. It was formerly the capital of the Longobardic kingdom, and is still remarkable for the broadness of its streets, the beauty and richness of some of its churches, and for its university founded by Charlemagne, and for several other literary institutions. Here is a bishop's see, which was once the richest in Italy, but is now dependent on the pope; and upon the whole the city is gone to decay, its trade being ruined through the exactions of the government. The few objects within it worth the public attention belong to the clergy or monks; and the church and convent of the Carthusians are inexpressibly noble, the court of the convent being one of the finest in the world, and surrounded by a portico supported by pillars, the whole a mile in circumference. It is defended by strong walls, large ditches, good ramparts, excellent bastions, and a bridge over the river Tasin. In the centre of the town is a strong castle, where the duke of Milan was wont to reside. There are a great number of magnificent castles, and some colleges. It was taken by the duke of Savoy in 1706; by the French in 1733; by the French and Spaniards in 1745; but retaken by the Austrians in 1746. E. Long. 9. 5. N. Lat. 45. 10.

PAVILION, in *Architecture*, signifies a kind of turret, or building, usually insulated, and contained under a single roof; sometimes square, and sometimes in form of a dome: thus called from the resemblance of its roof to a tent.

Pavilions are sometimes also projecting pieces, in the front of a building, marking the middle thereof; sometimes the pavilion flanks a corner, in which case it is called *an angular pavilion*. The Louvre is flanked with four pavilions: the pavilions are usually higher than the rest of the building. There are pavilions built in gardens, commonly called *summer-houses*, *pleasure-houses*, &c. Some castles or forts consist only of a single pavilion.

PAVILION, in military affairs, signifies a tent raised on posts, to lodge under in the summer-time.

PAVILION, is also sometimes applied to flags, colours, ensigns, standards, banners, &c.

PAVILION, in *Heraldry*, denotes a covering in form of a tent, which invests or wraps up the armories of divers kings and sovereigns, depending only on God and their sword.

The pavilion consists of two parts; the top, which is the chapeau, or coronet; and the curtain, which makes the mantle.

None but sovereign monarchs, according to the French heralds,

Pavilion ‖ Paving.

heralds, may bear the pavilion entire, and in all its parts. Thofe who are elective, or have any dependence, fay the heralds, muft take off the head, and retain nothing but the curtains.

PAVILIONS, among jewellers, the underfides and corners of the brilliants, lying between the girdle and the collet.

PAVING, the conftruction of ground-floors, ftreets, or highways, in fuch a manner that they may be conveniently walked upon. In Britain, the pavement of the grand ftreets, &c. is ufually of flint, or rubble ftone; courts, ftables, kitchens, halls, churches, &c. are paved with tiles, bricks, flags, or fire-ftone; fometimes with a kind of freeftone and ragftone.

In fome ftreets, e. g. of Venice, the pavement is of brick: churches fometimes are paved with marble, and fometimes with mofaic work, as the church of St Mark at Venice. In France, the public roads, ftreets, courts, &c. are all paved with gres or gritt, a kind of freeftone.

In Amfterdam and the chief cities of Holland, they call their brick pavement the *burgher-mafters pavement*, to diftinguifh it from the ftone or flint pavement, which ufually takes up the middle of the ftreet, and which ferves for carriages; the brick which borders it being deftined for the paffage of people on foot.

Pavements of free-ftone, flint, and flags, in ftreets, &c. are laid dry, i. e. in a bed of fand; thofe of courts, ftables, ground-rooms, &c. are laid in a mortar of lime and fand; or in lime and cement, efpecially if there be vaults or cellars underneath. Some mafons, after laying a floor dry, efpecially of brick, fpread a thin mortar over it; fweeping it backwards and forwards to fill up the joints. The feveral kinds of pavement are as various as the materials of which they are compofed, and whence they derive the name by which they are diftinguifhed; as,

1. *Pebble-paving*, which is done with ftones collected from the fea-beach, moftly brought from the iflands of Guernfey and Jerfey: they are very durable, indeed the moft fo of any ftone ufed for this purpofe. They are ufed of various fizes, but thofe which are from fix to nine inches deep, are efteemed the moft ferviceable. When they are about three inches deep, they are denominated *bolders* or *bowlers*; thefe are ufed for paving court-yards, and other places not accuftomed to receive carriages with heavy weights; when laid in geometrical figures, they have a very pleafing appearance.

2. *Rag-paving* was much ufed in London, but is very inferior to the pebbles; it is dug in the vicinity of Maidftone in Kent, from which it has the name of *Kentifh ragstone*; there are fquared ftones of this material for paving coach tracks and footways.

3. *Purbeck pitchens*; fquare ftones ufed in footways; they are brought from the ifland of Purbeck, and alfo frequently ufed in court-yards; they are in general from fix to ten inches fquare, and about five inches deep.

4. *Squared paving*, for diftinction by fome called *Scotch paving*, becaufe the firft of the kind paved in the manner that has been and continues to be paved, came from Scotland; the firft was a clear clofe ftone, called *blue whynn*, which is now difufed, becaufe it has been found inferior to others fince introduced in the order they are hereafter placed.

5. *Granite*, a hard material, brought alfo from Scotland, of a reddifh colour, very fuperior to the blue whynn quarry, and at prefent very commonly ufed in London.

6. *Guernfey*, which is the beft, and very much in ufe; it is the fame ftone with the pebble before fpoken of, but broken with iron hammers, and fquared to any dimenfions required of a prifmoidical figure, fet with its fmalleft bafe downwards. The whole of the foregoing paving fhould be bedded and paved in fmall gravel.

7. *Purbeck paving*, for footways, is in general got in large furfaces about two inches and a half thick; the blue fort is the hardeft and the beft of this kind of paving.

8. *Yorkfhire paving*, is an exceeding good material for the fame purpofe, and is got of almoft any dimenfions of the fame thicknefs as the Purbeck. This ftone will not admit the wet to pafs through it, nor is it affected by the froft.

9. *Ryegate* or *fireftone paving*, is ufed for hearths, ftoves, ovens, and fuch places as are liable to great heat, which does not affect the ftone if kept dry.

10. *Newcaftle flags*, are ftones about two feet fquare, and one inch and a half or two inches thick; they anfwer very well for paving out-offices: they are fomewhat like the Yorkfhire.

11. *Portland paving*, with ftone from the ifland of Portland; this is fometimes ornamented with black marble dots.

12. *Swedland paving*, is a black flate dug in Leicefterfhire, and looks well for paving halls, or in party-coloured paving.

13. *Marble paving*, is moftly variegated with different marbles, fometimes inlaid in mofaic.

14. *Flat brick paving*, done with brick laid in fand, mortar, or groute, as when liquid lime is poured into the joints.

15. *Brick-on-edge paving*, done with brick laid edgewife in the fame manner.

16. Bricks are alfo laid flat or edgewife in herringbone.

17. Bricks are alfo fometimes fet endwife in fand, mortar, or groute.

18. Paving is alfo performed with paving bricks.

19. With ten inch tiles.

20. With foot tiles.

21. With clinkers for ftables and outer offices.

22. With the bones of animals, for gardens, &c.

And, 23. We have knob paving, with large gravelftones, for porticoes, garden-feats, &c.

Pavements of churches, &c. frequently confift of ftones of feveral colours; chiefly black and white, and of feveral forms, but chiefly fquares and lozenges, artfully difpofed. Indeed, there needs no great variety of colours to make a furprifing diverfity of figures and arrangements. M. Truchet, in the Memoirs of the French Academy, has fhown by the rules of combination, that two fquare ftones, divided diagonally into two colours, may be joined together chequerwife 64 different ways: which appears furprifing enough; fince two letters or figures can only be combined two ways.

The reafon is, that letters only change their fituation with regard to the firft and fecond, the top and bottom remaining the fame; but in the arrangement of thefe ftones, each admits of four feveral fituations, in each whereof

whereof the other ſquare may be changed 16 times, which gives 64 combinations.

Indeed, from a further examination of theſe 64 combinations, he found there were only 32 different figures, each figure being repeated twice in the ſame ſituation, though in a different combination; ſo that the two only differed from each other by the tranſpoſition of the dark and light parts.

PAUL, formerly named SAUL, was of the tribe of Benjamin, a native of Tarſus in Cilicia, a Phariſee by profeſſion; firſt a perſecutor of the church, and afterwards a diſciple of Jeſus Chriſt, and apoſtle of the Gentiles. It is thought he was born about two years before our Saviour, ſuppoſing that he lived 68 years, as we read in a homily which is in the 6th volume of St Chryſoſtom's works. He was a Roman citizen (Acts xxii. 27, 28.), becauſe Auguſtus had given the freedom of the city to all the freemen of Tarſus, in conſideration of their firm adherence to his intereſts. His parents ſent him early to Jeruſalem, where he ſtudied the law at the feet of Gamaliel a famous doctor (id. xxii. 3.). He made very great progreſs in his ſtudies, and his life was always blameleſs before men; being very zealous for the whole obſervation of the law of Moſes (id. xxvi. 4, 5.). But his zeal carried him too far; he perſecuted the church, and inſulted Jeſus Chriſt in his members (1 Tim. i. 13.); and when the protomartyr St Stephen was ſtoned, Saul was not only conſenting to his death, but he even ſtood by and took care of the clothes of thoſe that ſtoned him (Acts vii. 58, 59.). This happened in the 33d year of the common era, ſome time after our Saviour's death.

At the time of the perſecution that was raiſed againſt the church, after the death of St Stephen, Saul was one of thoſe that ſhowed moſt violence in diſtreſſing the believers (Gal. i. 13. and Acts xxvi. 11.). He entered into their houſes, and drew out by force both men and women, loaded them with chains, and ſent them to priſon (Acts viii. 3. and xxii. 4.). He even entered into the ſynagogues, where he cauſed thoſe to be beaten with rods that believed in Jeſus Chriſt, compelling them to blaſpheme the name of the Lord. And having got credentials from the high-prieſt Caiaphas, and the elders of the Jews, to the chief Jews of Damaſcus, with power to bring to Jeruſalem all the Chriſtians he ſhould find there, he went away full of threats, and breathing nothing but blood (Acts ix. 1, 2, 3, &c.). But as he was upon the road, and now drawing near to Damaſcus, all on a ſudden about noon, he perceived a great light to come from heaven, which encompaſſed him and all thoſe that were with him. This ſplendour threw them on the ground; and Saul heard a voice that ſaid to him, "Saul, Saul, why perſecuteſt thou me?" It was Jeſus Chriſt that ſpoke to him. To whom Saul anſwered, "Who art thou, Lord?" And the Lord replied to him, "I am Jeſus of Nazareth whom thou perſecuteſt; it is hard for thee to kick againſt the pricks." Saul, all in conſternation, aſked, "Lord, what is it that thou wouldſt have me do?" Jeſus bid him ariſe and go to Damaſcus, where the will of the Lord ſhould be revealed to him.

Saul then roſe from the ground, and felt that he was deprived of ſight; but his companions led him by the hand, and brought him to Damaſcus, where he continued three days blind, and without taking any nouriſhment. He lodged at the houſe of a Jew named Judas. On the third day, the Lord commanded a diſciple of his, named Ananias, to go to find out Saul, to lay his hands upon him, and to cure his blindneſs. And as Ananias made excuſes, ſaying that this man was one of the moſt violent perſecutors of the church, the Lord ſaid to him, Go and find him, becauſe this man is an inſtrument that I have choſen, to carry my name before the Gentiles, before kings, and before the children of Iſrael; for I will ſhow him how many things he muſt ſuffer for my name. Ananias went therefore, and found Saul, laid his hand upon him, and reſtored him to his ſight; then riſing, he was baptized, and filled with the Holy Ghoſt. After this he continued ſome days with the diſciples that were at Damaſcus, preaching in the ſynagogues, and proving that Jeſus was the Meſſiah (A).

From Damaſcus he went into Arabia (Gal. i. 17.), probably

(A) The converſion of ſuch a man, at ſuch a time, and by ſuch means, furniſhes one of the moſt complete proofs that have ever been given of the divine origin of our holy religion. That Saul, from being a zealous perſecutor of the diſciples of Chriſt, became all at once a diſciple himſelf, is a fact which cannot be controverted without overturning the credit of all hiſtory. He muſt therefore have been converted in the miraculous manner in which he himſelf ſaid he was, and of courſe the Chriſtian religion be a divine revelation; or he muſt have been either an impoſtor, an enthuſiaſt, or a dupe to the fraud of others. There is not another alternative poſſible.

If he was an impoſtor, who declared what he knew to be falſe, he muſt have been induced to act that part by ſome motive: (See MIRACLE). But the only conceivable motives for religious impoſture are, the hopes of advancing one's temporal intereſt, credit, or power; or the proſpect of gratifying ſome paſſion or appetite under the authority of the new religion. That none of theſe could be St Paul's motive for profeſſing the faith of Chriſt crucified, is plain from the ſtate of Judaiſm and Chriſtianity at the period of his forſaking the former and embracing the latter faith. Thoſe whom he left were the diſpoſers of wealth, of dignity, of power, in Judea: thoſe to whom he went were indigent men, oppreſſed, and kept from all means of improving their fortunes. The certain conſequence therefore of his taking the part of Chriſtianity was the loſs not only of all that he poſſeſſed, but of all hopes of acquiring more; whereas, by continuing to perſecute the Chriſtians, he had hopes riſing almoſt to a certainty of making his fortune by the favour of thoſe who were at the head of the Jewiſh ſtate, to whom nothing could ſo much recommend him as the zeal which he had ſhown in that perſecution. As to credit or reputation, could the ſcholar of Gamaliel hope to gain either by becoming a teacher in a college of fiſhermen? Could he flatter himſelf, that the doctrines which he taught would, either in or out of Judea, do him honour, when he knew that "they were to the Jews a ſtumbling block, and to the Greeks fooliſhneſs?" Was it then the love of power that induced him to make this great change? Power! over whom? over a flock of ſheep whom he himſelf had aſſiſted to deſtroy,

Paul.

probably into the neighbourhood of Damafcus, being then under the government of Aretas king of Arabia; and having remained there for a little while, he returned to Damafcus, where he began again to preach the gofpel. The Jews could not bear to fee the progrefs that the gofpel made here; and fo refolved to put him to death: and they gained to their fide the governor of Damafcus, who was to apprehend him, and to deliver him to them. Of this Saul had early notice; and knowing that the gates of the city were guarded night and day to prevent him from making his efcape, he was let down over the wall in a bafket. And coming to Jerufalem to fee Peter (Gal. i. 38.), the difciples were afraid to have any correfpondence with him, not believing him to be a convert. But Barnabas having brought him to the apoftles, Saul related to them the manner of his converfion, and all that had followed in confequence of it. Then he began to preach both to the Jews and Gentiles, and fpoke to them with fuch ftrength of argument, that not being able to withftand him in reafoning, they refolved to kill him. For this reafon, the brethren brought him to Cæfarea of Paleftine, from whence he came, probably by fea, into his own country Tarfus in Cilicia.

There he continued about five or fix years, from the year of Chrift 37 to the year 43; when Barnabas coming to Antioch by the order of the apoftles, and there having found many Chriftians, went to Tarfus to fee Saul, and brought him with him to Antioch (Acts xi. 20, 25, 26.); where they continued together a whole year, preaching to and inftructing the faithful. During this time, there happened a great famine in Judea (id. ib. 27, 28, &c.), and the Chriftians of Antioch having made fome collections to affift their brethren at Jerufalem, they made choice of Paul and Barnabas to go thither with their offering. They arrived there in the year of Chrift 44; and having acquitted themfelves of their commiffion, they returned again to Antioch. They had not been there long before God warned them by the prophets he had in this church, that he had appointed them to carry his word into other places. Then the church betook themfelves to fafting and praying, and the prophets Simeon, Lucius, and Manaen, laid their hands on them, and fent them to preach whither the Holy Ghoft fhould conduct them. And it was probably about this time, that is, about the year of Chrift 44, that Paul being rapt up into the third heaven, faw there ineffable things, and which were above the comprehenfion of man (2 Cor. xii. 2, 3, 4. and Acts xiii. 4, 5, 6, &c.).

Saul and Barnabas went firft into Cyprus, where they began to preach in the fynagogues of the Jews. When they had gone over the whole ifland, they there found a Jewifh magician called Bar jefus, who was with the proconful Sergius Paulus; and who refifted them, and endeavoured to prevent the proconful from embracing Chriftianity: whereupon St Paul ftruck him with blindnefs; by which miracle the proconful, being an eyewitnefs of it, was converted to the Chriftian faith.

From this converfion, which happened at the city of Paphos, in the year of Chrift 45, many think, that the apoftle firft began to bear the name of *Paul*, which St Luke always gives him afterwards, as is fuppofed in memory of his converting Sergius Paulus. Some believe

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ftroy, and whofe very Shepherd had lately been murdered? Perhaps it was with the view of gratifying fome licentious paffion, under the authority of the new religion, that he commenced a teacher of that religion! This cannot be alleged; for his writings breathe nothing but the ftricteft morality, obedience to magiftrates, order, and government, with the utmoft abhorrence of all licentioufnefs, idlenefs, or loofe behaviour, under the cloak of religion. We nowhere read in his works, that faints are above moral ordinances; that dominion is founded in grace; that monarchy is defpotifm which ought to be abolifhed; that the fortunes of the rich ought to be divided among the poor; that there is no difference in moral actions; that any impulfes of the mind are to direct us againft the light of our reafon and the laws of nature; or any of thofe wicked tenets by which the peace of fociety has been often difturbed, and the rules of morality often broken, by men pretending to act under the fanction of divine revelation. He makes no diftinctions like the impoftor of Arabia in favour of himfelf; nor does any part of his life, either before or after his converfion to Chriftianity, bear any mark of a libertine difpofition. As among the Jews, fo among the Chriftians, his converfation and manners were blamelefs.—It has been fometimes objected to the other apoftles, by thofe who were refolved not to credit their teftimony, that having been deeply engaged with Jefus during his life, they were obliged, for the fupport of their own credit, and from having gone too far to return, to continue the fame profeffions after his death; but this can by no means be faid of St Paul. On the contrary, whatever force there may be in that way of reafoning, it all tends to convince us, that St Paul muft *naturally* have continued a Jew, and an enemy to Chrift Jefus. If *they* were engaged on one fide, *he* was as ftrongly engaged on the other. If fhame withheld them from changing fides, much more ought it to have ftopped him; who, from his fuperior education, muft have been vaftly more fenfible to that kind of fhame than the mean and illiterate fifhermen of Galilee. The only other difference was, that *they*, by quitting their Mafter after his death, might have preferved themfelves; whereas *he*, by quitting the Jews, and taking up the crofs of Chrift, certainly brought on his own deftruction.

As St Paul was not an impoftor, fo it is plain he was not an enthufiaft. Heat of temper, melancholy, ignorance, and vanity, are the ingredients of which enthufiafm is compofed; but from all thefe, except the firft, the apoftle appears to have been wholly free. That he had great fervour of zeal, both when a Jew and when a Chriftian, in maintaining what he thought to be right, cannot be denied; but he was at all times fo much mafter of his temper, as, in matters of indifference, to "become all things to all men," with the moft pliant condefcenfion, bending his notions and manners to theirs, as far as his duty to God would permit; a conduct compatible neither with the ftiffnefs of a bigot nor with the violent impulfes of fanatical delufion. That he was not melancholy, is plain from his conduct in embracing every method which prudence could fuggeft to efcape danger and fhun perfecution,

Paul. lieve that he changed his name upon his own conversion; and Chrysostom will have this change to take place at his ordination, when he received his mission at Antioch; while others say, he took the name *Paul* only when he began to preach to the Gentiles: and, finally, several are of opinion, that he went by the names of both *Saul* and *Paul*, like many other Jews who had one Hebrew name and another Greek or Latin one.

From the isle of Cyprus, St Paul and his company went to Perga in Pamphylia, where John Mark left them, to return to Jerusalem: but making no stay at Perga, they came to Antioch in Pisidia; where going into the synagogue, and being desired to speak, St Paul made them a long discourse, by which he showed, that Jesus Christ was the Messiah foretold by the prophets, and declared by John the Baptist; that he had been unjustly put to death by the malice and jealousy of the Jews; and that he rose again the third day. They heard him very attentively; and he was desired to discourse again on the same subject the next Sabbath-day; and several, both Jews and Gentiles, followed them, to receive particular instructions more at leisure. On the Sabbath-day following, almost all the city met together to hear the word of God: but the Jews, seeing the concourse of people, were moved with envy at it; opposed, with blasphemies, what St Paul said; and not being able to bear the happy progress of the gospel in this country, they raised a persecution against the two apostles: whereupon Paul and Barnabas, shaking off the dust upon their feet against them, came from Antioch in Pisidia to Iconium. Being come thither, they preached in their synagogue, and converted a great number, both of Jews and Gentiles; and God confirmed their commission by a great number of miracles (Acts xiv. 1, 2, &c.). In the mean time, the unbelieving Jews, having incensed the Gentiles against Paul and Barnabas, and threatening to stone them, they were obliged to retire to Lystra and Derbe, cities of Lycaonia, where they preached the gospel. At Lystra, there was a man who had been lame from his mother's womb. This man fixing his eyes on St Paul, the apostle bid him rise, and stand upon his feet: whereupon he presently rose up, and walked; the people, seeing this miracle, cried out, that the gods were descended among them in the shape of men. They called Barnabas *Jupiter*, and Paul *Mercury*, because of his eloquence, and being the chief speaker. The priest of Jupiter brought also garlands and bulls before the gate, to offer sacrifices to them: but Paul and Barnabas tearing their clothes, and casting themselves into the middle of the multitude, cried out to them, Friends, what do you do? we are men as well as yourselves; and we are preaching to you to turn away from these vain superstitions, and to worship only the true God, who has made heaven and earth. But whatever they could say, they had much ado to restrain them from offering sacrifices to them. Paul.

In the mean time, some Jews of Antioch in Pisidia and of Iconium coming to Lystra, animated the people against the apostles. They stoned Paul, and drew him out of the city, thinking him to be dead. But the disciples gathering together about him, he rose up among them

cution, when he could do it without betraying the duty of his office or the honour of his God. A melancholy enthusiast courts persecution; and when he cannot obtain it, afflicts himself with absurd penances: but the holiness of St Paul consisted only in the simplicity of a godly life, and in the unwearied performance of his apostolical duties. That he was ignorant, no man will allege who is not grossly ignorant himself; for he appears to have been master not only of the Jewish learning, but also of the Greek philosophy, and to have been very conversant even with the Greek poets. That he was not credulous, is plain from his having resisted the evidence of all the miracles performed on earth by Christ, as well as those that were afterward worked by the apostles; to the fame of which, as he lived in Jerusalem, he could not possibly have been a stranger. And that he was as free from vanity as any man that ever lived, may be gathered from all that we see in his writings, or know of his life. He represents himself as the least of the apostles, and not meet to be called an apostle. He says that he is the chief of sinners; and he prefers, in the strongest terms, universal benevolence to faith, and prophecy, and miracles, and all the gifts and graces with which he could be endowed. Is this the language of vanity or enthusiasm? Did ever fanatic prefer virtue to his own religious opinions, to illuminations of the spirit, and even to the merit of martyrdom?

Having thus shown that St Paul was neither an impostor nor an enthusiast, it remains only to be inquired, whether he was deceived by the fraud of others: but this inquiry needs not be long, for who was to deceive him? A few illiterate fishermen of Galilee? It was *morally* impossible for such men to conceive the thought of turning the most enlightened of their opponents, and the cruellest of their persecutors, into an apostle, and to do this by a fraud in the very instant of his greatest fury against them and their Lord. But could they have been so extravagant as to conceive such a thought, it was *physically* impossible for them to execute it in the manner in which we find his conversion to have been effected. Could they produce a light in the air, which at mid-day was brighter than the sun? Could they make Saul hear words from out of that light which were not heard by the rest of the company? Could they make him blind for three days after that vision, and then make scales fall off from his eyes, and restore him to sight by a word? Or, could they make him and those who travelled with him believe, that all these things had happened, if they had not happened? Most unquestionably no fraud was equal to all this.

Since then St Paul was neither an impostor, an enthusiast, nor deceived by the fraud of others, it follows, that his conversion was miraculous, and that the Christian religion is a divine revelation. See Lyttleton's "Observations on the Conversion of St Paul;" a treatise to which it has been truly said, that infidelity has never been able to fabricate a specious answer, and of which this note is a very short and imperfect abridgement.

them, entered again into the city, and the day after left it with Barnabas to go to Derbe. And having here preached the goſpel alſo, they returned to Lyſtra, to Iconium, and to Antioch of Piſidia. Paſſing throughout Piſidia, they came to Pamphylia, and having preached the word of God at Perga, they went down into Attalia. From hence they ſet ſail for Antioch in Syria, from whence they had departed a year before. Being arrived there, they aſſembled the church together, and told them the great things God had done by their means, and how he had opened to the Gentiles a door of ſalvation; and here they continued a good while with the diſciples.

St Luke does not inform us of the actions of St Paul from the 45th year of Chriſt to the time of the council at Jeruſalem, which was held in the 50th year of Chriſt. There is great likelihood that it was during this interval that St Paul preached the goſpel from Jeruſalem to Illyricum, as he informs us in his epiſtle to the Romans (xv. 19.); and this without making any ſtay in thoſe places where others had preached before him. He does not acquaint us with the particulars of theſe journeys, nor with the ſucceſs of his preaching; but he ſays in general, that he had ſuffered more labours than any other, and had endured more priſons. He was often very near death itſelf, ſometimes upon the water and ſometimes among thieves. He run great dangers, ſometimes from the Jews and ſometimes among falſe brethren and perverſe Chriſtians; he was expoſed to great hazards, as well in the cities as in the deſerts: he ſuffered hunger, thirſt, nakedneſs, cold, faſtings, watchings (2 Cor. xi. 23.—27.), and the fatigues inſeparable from long journeys, which were undertaken without any proſpect of human ſuccour; in this very different from the good fortune of others who lived by the goſpel, who received ſubſiſtence from thoſe to whom they preached it, and who were accompanied always by religious women, who miniſtered to them in their neceſſary occaſions. He made it a point of honour to preach gratis, working with his hands that he might not be chargeable to any one (1 Cor. ix. 1.—15.); for he had learned a trade, as was uſual among the Jews, which trade was to make tents of leather for the uſe of thoſe that go to war (Acts xviii. 3.).

St Paul and St Barnabas were at Antioch when ſome perſons coming from Judea (Acts xv. 1, 2, &c.) pretended to teach, that there was no ſalvation without circumciſion, and without the obſervation of the other legal ceremonies. Epiphanius and Philaſter ſay, that he that maintained this was Cerinthus and his followers. Paul and Barnabas withſtood theſe new doctors; and it was agreed to ſend a deputation to the apoſtles and elders at Jeruſalem about this queſtion. Paul and Barnabas were deputed; and being arrived at Jeruſalem, they reported to the apoſtles the ſubject of their commiſſion. Some of the Phariſees that had embraced the faith, aſſerted, that the Gentiles that were converted ought to receive circumciſion, and to obſerve the reſt of the law. But the apoſtles and elders aſſembling to examine into this matter, it was by them decreed, that the Gentiles, who were converted to Chriſtianity, ſhould not be obliged to ſubmit to the yoke of the law, but only to avoid idolatry, fornication, and the eating of things ſtrangled, and blood.

St Paul and St Barnabas were then ſent back to Antioch with letters from the apoſtles, which contained the deciſion of the queſtion, and the reſolution of that auguſt aſſembly. The apoſtles alſo deputed Jude ſurnamed *Barſabas* and Silas, who were principal brethren, to go to Antioch with Paul and Barnabas to give their teſtimony alſo of what had been decreed at Jeruſalem. Being arrived at Antioch, they aſſembled the faithful, read to them the apoſtles letter, and acquainted them, that it had been reſolved to diſcharge them from the yoke of the ceremonial law. Some time after this, St Peter coming to Antioch and joining himſelf to the converted Gentiles, he lived with them without ſcruple; but ſome brethren happening to arrive there from Jeruſalem, he ſeparated himſelf from the Gentile converts, and did no longer eat with them: for which conduct St Paul publicly cenſured him (Gal. ii. 11—16.). St Paul (id. ii. 2, 3, &c.) in the ſame journey to Jeruſalem declared openly to the faithful there the doctrine he preached among the Gentiles; and beſides, diſcourſed of it in private among the chief of them in preſence of Barnabas and Titus. St Peter, St James, and St John, with whom he had theſe converſations, could find nothing either to be added or amended in ſo pure and ſo ſound a doctrine and demeanour. They ſaw with joy the grace that God had given him; they acknowledged that he had been appointed the apoſtle of the Gentiles, as St Peter had been of the circumciſion. They concluded that Paul and Barnabas ſhould continue to preach among the Gentiles; and only recommended to them to take care concerning the collections for the poor; that is to ſay, to exhort the converted Chriſtians among the Gentiles, to aſſiſt the faithful brethren in Judea, who were in neceſſity; whether it were becauſe they had ſold and diſtributed their goods, or becauſe they had been taken away from them (Heb. x. 54.).

After Paul and Barnabas had continued ſome days at Antioch, St Paul propoſed to Barnabas to return and viſit the brethren through all the cities wherein they had planted the goſpel, to ſee in what condition they were. Barnabas conſented to the propoſal; but inſiſted upon taking John Mark along with them. This was oppoſed by Paul, which produced a ſeparation between them. Barnabas and John Mark went together to Cyprus; and St Paul, making choice of Silas, croſſed over Syria and Cilicia, and came to Derbe, and afterwards to Lyſtra (Acts xvi. 1, 2, &c.). Here they found a diſciple, called *Timothy*, whom St Paul took with him, and circumciſed him that he might not offend the Jews of that country. When, therefore, they had gone over the provinces of Lycaonia, Phrygia, and Galatia, the Holy Ghoſt would not allow them to preach the goſpel in the proconſular Aſia, which contained Ionia, Æolia, and Lydia. They therefore went on to Myſia, and coming to Troas, St Paul had a viſion in the night. A man, habited like a Macedonian, preſented himſelf before him, and ſaid, Paſs into Macedonia and come and ſuccour us. Immediately he ſet out on this journey, not doubting but that God had called him into this country.

Embarking therefore at Troas, they ſailed to Neapolis. Thence they came to Philippi, where upon the ſabbath-day they went near the river ſide, where the Jews had a place of devotion, and where they found ſome religious women, among whom was Lydia, who was converted and baptized, and invited the apoſtle and

his

Paul. his company to lodge at her houſe. Another day, as they went to the ſame place of devotion, they happened to meet a maid ſervant poſſeſſed with a ſpirit of divination, who followed St Paul and his company, crying out, that theſe men were the ſervants of the moſt high God, who declared to the world the way of ſalvation. This ſhe did for ſeveral days together; at laſt St Paul, turning himſelf towards her, ſaid to the ſpirit, I command thee in the name of Jeſus Chriſt to come out of the body of this woman: upon which it immediately left her. But the maſters of this damſel, who made much money by her, drew Paul and Silas before the magiſtrates, and accuſed them of attempting to introduce a new religion into the city. For this the magiſtrates ordered them to be whipt with rods upon the back and ſhoulders, and afterwards ſent them to priſon.

Towards midnight, as Paul and Silas were ſinging hymns and praiſes to God, on a ſudden there was a great earthquake, ſo that the foundations of the priſon were ſhaken, and all the doors flew open at the ſame time, and the fetters of the priſoners burſt aſunder. The gaoler being awakened at this noiſe, and ſeeing all the doors open, he drew his ſword with an intention to kill himſelf, imagining that all the priſoners had made their eſcape. But Paul cried out to him, that he ſhould do himſelf no miſchief, for they were all ſafe. Then the gaoler entering and finding all the priſoners there, he brought out Paul and Silas from this place, aſking them what he muſt do to be ſaved? Paul and Silas inſtructing him and all his family, gave them baptiſm. After this the gaoler ſet before them ſomething to eat; and when the morning was come, the magiſtrates ſent him word that he might releaſe his priſoners, and let them go about their buſineſs. But Paul returned this anſwer to the magiſtrates; Ye have publicly whipped us with rods, being Roman citizens; ye have thrown us into priſon; and now ye would privately diſmiſs us: But it ſhall not be ſo, for you yourſelves ſhall come to fetch us out. The magiſtrates hearing that they were Roman citizens, came to excuſe themſelves; and having brought them out of priſon, they deſired them to depart out of their city. Paul and Silas went firſt to the houſe of Lydia, where having viſited and comforted the brethren, they departed from Philippi.

Then paſſing through Amphipolis and Apollonia, they came to Theſſalonica the capital city of Macedonia, where the Jews had a ſynagogue (Acts xvii. 1, &c.). Paul entered therein, according to his cuſtom, and there preached the goſpel to them for three Sabbath-days ſucceſſively. Some Jews and ſeveral proſelytes believed in Jeſus Chriſt, and united themſelves to Paul and Silas: but the greateſt part of the Jews being led away by a falſe zeal, raiſed a tumult in the city, and went to the houſe of Jaſon where St Paul lodged. But not finding him there, they took Jaſon and led him before the magiſtrates, where they accuſed him of harbouring in his houſe people that were diſobedient to the ordinances of the emperor, and who affirmed that there was another king beſides him, one Jeſus whom they preached up. But Jaſon having given ſecurity to anſwer for the people who were accuſed, he was diſmiſſed to his own houſe; and the night following the brethren conducted Paul and Silas out of the city, who went to Berea, where they began to preach in the ſynagogue. The Jews of Berea heard them gladly, and many of them were converted; as alſo ſeveral of the Gentiles, and many women of diſtinction that were not Jeweſſes. Paul.

The Jews of Theſſalonica being informed that Paul and Silas were at Berea, came thither and animated the mob againſt them; ſo that St Paul was forced to withdraw, leaving Silas and Timothy at Berea to finiſh the work he had ſo happily begun. Thoſe who conducted St Paul embarked along with him, and brought him as far as Athens (Theod. in 1 Theſſal.), where he arrived in the 52d year of Jeſus Chriſt. As ſoon as he was got thither, he ſent back thoſe that had brought him, with orders to tell Silas and Timothy, that he deſired them to follow him to Athens as ſoon as poſſible. In the mean time, he went into a ſynagogue of the Jews, and preached to them as often as he had opportunity; and diſputing with the philoſophers who were frequent in that place, they at laſt brought him before the Areopagus, accuſing him of introducing a new religion. St Paul being come before the judges, pleaded in his own defence, that among other marks of ſuperſtition which he had found in that city, he had obſerved an altar inſcribed, "To the unknown God." It was therefore this God whom they confeſſed that they knew not, that he came to make known to them. Afterwards he ſpoke to them of God the creator of heaven and earth, of the ſuperintendence of a providence, of the laſt judgment, and of the reſurrection of the dead. But after they had heard of the reſurrection, ſome made ſcorn of him, and others deſired to hear him another time. However ſome of them embraced the Chriſtian faith, of which number was Dionyſius a ſenator of the Areopagus, and a woman called *Damaris*, and ſeveral others with them.

St Timothy came from Berea to Athens according to the requeſt of St Paul, and informed him of the perſecution with which the Chriſtians of Theſſalonica were then afflicted. This obliged the apoſtle to ſend him into Macedonia, that he might comfort them and keep them ſtedfaſt (1 Theſſal. iii. 1, 2, &c.). After this St Paul left Athens and went to Corinth, where he lodged with one Aquila a Jew, and by trade a tentmaker (Acts xviii. 1, 2, &c.). With this Aquila the apoſtle worked, as being of the ſame trade himſelf. But, however, he did not neglect the preaching of the goſpel, which he performed every day in the ſynagogue; ſhowing both to the Jews and Gentiles that Jeſus was the Meſſiah. There he made ſeveral converts: and he tells us himſelf (1 Cor. i. 14—17. and xvi. 15.) that he baptized Stephanus and his whole houſe, with Criſpus and Gaius. About the ſame time Silas and Timothy came to Corinth, and acquainted him with the good ſtate of the faithful at Theſſalonica; and ſoon after this, he wrote his firſt epiſtle to the Theſſalonians, which is the firſt of all the epiſtles that he wrote; and not long after he wrote his ſecond epiſtle to that church.

St Paul, now finding himſelf encouraged by the preſence of Silas and Timothy, went on with the work of his miniſtry with new ardour, declaring and proving that Jeſus Chriſt was the true Meſſiah. But the Jews oppoſing him with blaſphemous and opprobrious words, he ſhook his clothes at them, and ſaid, "Your blood be upon your own head; from henceforth I ſhall go to the Gentiles." He then quitted the houſe of Aquila, and went to lodge with one Titus Juſtus, who was original-

Paul.

ly a Gentile, but one that feared God. In the mean time the Lord appeared to St Paul in a vision, told him, that in Corinth he had much people; and this was the reason why the apostle continued there eight months.

But Gallio the proconsul of Achaia being at Corinth, the Jews of that city rose up against Paul and carried him before Gallio, accusing him of attempting to introduce a new religion among them: however, Gallio sent them away, telling them he would not meddle with disputes that were foreign to his office. Paul continued some time longer at Corinth; but at last he set out for Jerusalem, where he had a mind to be present at the feast of Pentecost. Before he went on shipboard, he cut off his hair at Cenchrea, because he had completed his vow of Nazariteship, in which he had engaged himself. He arrived at Ephesus with Aquila and Priscilla, from whence he went to Cæsarea of Palestine, and thence to Jerusalem. Here having performed his devotions, he came to Antioch, where he stayed some time; and then passing from thence, he made a progress through all the churches of Galatia and Phrygia successively; and having gone over the higher provinces of Asia, he returned to Ephesus, where he abode three years; that is, from the year of Christ 54 to the year 57 (Acts xix. 1, 2, &c.).

St Paul having arrived at Ephesus, he found there some disciples that had been initiated by Apollos, who had only baptized them with the baptism of John. St Paul instructed them, baptized them with the baptism of Jesus Christ, and laid his hands on them; whereupon they received the Holy Ghost, the gifts of languages and of prophecy. The apostle afterwards went into the synagogue, and preached to the Jews for three months, endeavouring to convince them that Jesus Christ was the Messiah: but as he found them very obstinate, he separated himself from them, and taught daily in the school of one Tyrannus. He performed there several miracles, insomuch, that the linen that had but touched his body, being afterwards applied to the sick, they were presently cured of their diseases, or delivered from the devils that possessed them. He also suffered much there, as well from the Jews as from the Gentiles; and he himself informs us (1 Cor. xv. 31, 32.), that after the manner of men he fought with beasts at Ephesus; that is to say, that he was exposed to wild beasts in the amphitheatre, so that it was expected he should have been devoured by them; but God miraculously delivered him: though some are of opinion, that the fight here mentioned by St Paul was nothing else but the scuffle he had with Demetrius the silver-smith and his companions, who were disappointed in their attempt of putting the apostle to death. It was during his abode at Ephesus that the apostle wrote his epistle to the Galatians.

After this St Paul proposed, at the instigation of the Holy Ghost, to pass through Macedonia and Achaia, and afterwards to go to Jerusalem, saying, that after he had been there, he must also see Rome; and having sent Timothy and Erastus before to Macedonia, he tarried some time in Asia. During this time, he received intelligence that domestic troubles had risen in the church of Corinth, and that abuses had begun to creep in; which made him resolve to write his first epistle to that church.

Soon after this, taking leave of the disciples, he departed for Macedonia (Acts xx. 1, 2, &c.). He embarked at Troas, took Timothy with him, and together passed into Macedonia (2 Cor. ii. 12. and vii. 5—15.). Titus came thither to him, and acquainted him with the good effects that his letter had produced among the Corinthians; and told him, that the collections that had been made by the church of Corinth for the faithful in Palestine were now ready; which engaged Paul to write a second letter to the Corinthians. St Paul, having passed through Macedonia, came into Greece or Achaia, and there continued three months. He visited the faithful of Corinth: and having received their alms, as he was upon the point of returning into Macedonia, he wrote his epistle to the Romans.

At last he left Greece and came into Macedonia, in the year of Christ 58, intending to be at Jerusalem at the feast of Pentecost. He staid some time at Philippi, and there celebrated the feast of the passover. From hence he embarked and came to Troas, where he continued a week. On the first day of the week the disciples being assembled to break bread, as St Paul was to depart the day following, he made a discourse to them which held till midnight. During this time a young man called Eutychus, happening to sit in a window and fall asleep, fell down three stories high, and was killed by the fall. St Paul came down to him, and embraced him, and restored him to life again. Then he went up again, broke bread and ate it, and continued his discourse till daybreak, at which time he departed. Those of his company took ship at Troas; but as for himself he went on foot as far as Assos, otherwise called *Apollonia*, and then embarked along with them at Mitylene. From hence he came to Miletus, whither the elders of the church of Ephesus came to see him; for he had not time to go to them, because he was desirous of being at Jerusalem at the feast of Pentecost.

When these elders had arrived at Miletus, St Paul discoursed with them, and told them that he was going to Jerusalem without certainly knowing what should happen to him; however he did not doubt but that he had much to suffer there, since in all cities the Holy Ghost had given him to understand, that chains and afflictions waited for him at Jerusalem. Nevertheless, he declared to them, that all this did not terrify him, provided he could but fulfil his ministry. After having exhorted them to patience, and having prayed along with them, he went on board, going straight to Coos, then to Rhodes, and thence to Patara (Acts xxi. 1, 2, &c.), where finding a ship that was bound for Phoenicia, they went on board and arrived safe at Tyre. Here they made a stop for seven days, and then going on, they arrived at Ptolemais, and thence at Cæsarea, where they found Philip the evangelist, who was one of the seven deacons. While St Paul was there, the prophet Agabus arrived there also from Judea; and have taken St Paul's girdle, he bound his own hands and feet with it, saying, "Thus shall the Jews of Jerusalem bind the man that owns this girdle, and shall deliver him up to the Gentiles." But St Paul's constancy was not shaken by all these predictions, and he told them, that he was ready, not only to suffer bounds, but death itself, for the name of Christ.

When he was come to Jerusalem, the brethren received

Paul. ceived him with joy; and the day following he went to see St James the Less, bishop of Jerusalem, at whose house all the elders assembled. Paul gave them an account of what God had done among the Gentiles by his ministry. Then St James informed him, that the converted Jews were strangely prejudiced against him, because they were informed he taught the Jews that lived among the Gentiles and out of Palestine, that they ought to renounce the law of Moses, and no longer circumcise their children. Therefore, continued St James, we must assemble them here together, where you may speak to them yourself, and undeceive them. Moreover do this, that your actions may verify your words: join yourself to four men that are here, and who have taken upon them a vow of Nazariteship; and that you may share in the merit of their action, contribute to the charge of their purification, and purify yourself also, that you may offer with them the offerings and sacrifices ordained for the purification of a Nazarite. See NAZARITE.

St Paul exactly followed this advice of St James, and on the next day went into the temple, where he declared to the priests, that in seven days these four Nazarites would complete their vow of Nazariteship; and that he would contribute his share of the charges. But towards the end of these seven days, the Jews of Asia having seen him in the temple, moved all the people against him, laid hold of him, and cried out, "Help, ye Israelites, that is he that teaches every where against the law, and against the temple, and has brought Gentiles into the temple, and profaned this holy place." At the same time they laid hold on him, shut the gates of the temple, and would have killed him, had not Lysias the tribune of the Roman garrison there run to his rescue, taken him out of their hands, and brought him into the citadel. St Paul being upon the steps, desired the tribune to suffer him to speak to the people, who followed him thither in a great multitude. The tribune permitted him, and St Paul, making a sign with his hand, made a speech in Hebrew (Acts xxii.), and related to them the manner of his conversion, and his mission from God to go and preach to the Gentiles. At his mentioning the Gentiles, the Jews began to cry out, "Away with this wicked fellow out of the world, for he is not worthy to live."

Immediately the tribune made him come into the castle, and ordered that he should be examined by whipping him, in order to make him confess the matter why the Jews were so incensed against him. Being now bound, he said to the tribune, "Is it lawful for you to whip a Roman citizen before you hear him?" The tribune hearing this, caused him to be unbound, and calling together the priests and the senate of the Jews, he brought Paul before them, that he might know the occasion of this tumult of the people. Then Paul began to speak to them to this purpose, (Acts xxiii.): "Brethren, I have lived in all good conscience before God until this day." At which words, Ananias, son of Nebedeus, who was the chief-priest, ordered the by-standers to give him a blow in the face. At which St Paul said to him, "God shall smite thee, thou whited wall; for sittest thou to judge me after the law, and commandest me to be smitten contrary to the law?" Those that were present said to him, "Revilest thou God's high priest?" St Paul excused himself by saying, that he did not know he was the high-priest, "For it is written, thou shalt not speak evil of the ruler of thy people." Then perceiving that part of the assembly were Sadducees, and part Pharisees, he cried out, "Brethren, I am a Pharisee, the son of a Pharisee; of the hope and resurrection of the dead I am called in question." Paul.

Then the assembly being divided in interests and opinions, and the clamour increasing more and more, the tribune ordered the soldiers to fetch him away out of the assembly, and bring him into the castle. The following night the Lord appeared to Paul, and said to him, "Take courage, for as you have borne testimony of me at Jerusalem, so must you also at Rome." The day following more than 40 Jews engaged themselves by an oath, not to eat or drink till they had killed Paul. They came, therefore, and made known their design to the priests and chiefs of the people, saying to them, "To-morrow cause Paul to appear before you, as if you would inquire more accurately into his affair, and before he can come to you, we will lie in wait for him and kill him." But St Paul, being informed of this conspiracy by his sister's son, acquainted the tribune with it; who gave orders that the night following he should be sent to Cæsarea, to Felix the governor, who had his ordinary residence there. Felix having received letters from Lysias, and being informed that St Paul was of Cilicia, he told him he would hear him when his accusers should arrive.

Five days after, Ananias the high-priest and some of the senators came to Cæsarea, bringing with them Tertullus the orator, to plead against Paul. Tertullus accused him of being a seditious person, a disturber of the public peace; one who had put himself at the head of a sect of Nazarenes, and who made no scruple even to profane the temple, (id. xxiv.). But St Paul easily refuted these calumnies, and defied his accusers to prove any of the articles they had exhibited against him: he ended his discourse by saying, "That for the doctrine of the resurrection from the dead, his adversaries would have him condemned." Felix put off the further hearing of this cause till another time; and, some days afterwards, came himself with his wife Drusilla to hear Paul; and being in hopes that the apostle would purchase his freedom with a sum of money, he used him well, often sent for him, and had frequent conversations with him.

Two years having thus passed away, Felix made way for his successor Portius Festus; but being willing to oblige the Jews, he left Paul in prison. Festus being come to Jerusalem, the chief priests desired to send for Paul, with a design to fall upon him by the way. But Festus told them, they might come to Cæsarea, where he would do them justice. Hither the Jews came, and accused Paul of several crimes, of which they were able to prove nothing (id. xxv.). Festus then proposed to the apostle to go to Jerusalem, and be tried there; but he answered, "That he was now at the emperor's tribunal, where he ought to be tried; and that he appealed to Cæsar:" whereupon Festus, having conferred with his council, told him, that therefore to Cæsar he should go.

Some days after, King Agrippa and his wife Berenice coming to Cæsarea, desired to hear Paul; who pleaded,

Paul. pleaded his cause with such ability, that Agrippa exclaimed, "Almost thou persuadest me to be a Christian." See AGRIPPA.

As soon, therefore, as it was resolved to send Paul into Italy, he was put on board a ship at Adramyttium, a city of Mysia; and having passed over the seas of Cilicia and Pamphylia, they arrived at Myra, in Lycia, where, having found a ship that was bound for Italy, they went on board, (*id.* xxvii.). But the season being far advanced (for it was at least the latter end of September), and the wind proving contrary, they with much difficulty arrived at the Fair Haven, a port in the isle of Crete. St Paul advised them to winter there: however, others were of opinion they had better go to Phenice, another harbour of the same island; but as they were going thither, the wind drove them upon a little island called *Clauda*, where the mariners, fearing to strike upon some bank of sand, they lowered their mast, and surrendered themselves to the mercy of the waves. Three days after this, they threw overboard the tackling of the ship. Neither sun nor stars had appeared now for 14 days. In this extreme danger, an angel appeared to St Paul, and assured him, that God had given him the lives of all that were in the ship with him; which were in all 276 souls. St Paul told them of his vision, exhorted them to take courage, and promised them that they should all come alive into an island; and that the vessel only should be lost. On the 14th night the seamen cast out the lead, and thought by their sounding that they approached near to some land. They were attempting to save themselves by going into the boat; but St Paul told the centurion and the soldiers, that except the sailors continued in the ship, their lives could not be saved. Then the soldiers cut the ropes of the boat, and let her drive. About daybreak, St Paul persuaded them to take some nourishment, assuring them that not a hair of their heads should perish. After his example, they took some food, and when they had eaten, they lightened their vessel, by throwing the corn into the sea. Day being come, they perceived a shore, where they resolved, if possible, to bring the ship to. But the vessel having struck against a neck of land that run out into the sea, so that the head remained fixed, and the stern was exposed to the mercy of the waves; the soldiers, fearing lest any of the prisoners should make their escape by swimming, were for putting them all to the sword. But the centurion would not suffer them, being willing to save Paul; and he commanded those that could swim to throw themselves first out of the vessel; and the rest got planks, so that all of them came safe to shore. Then they found that the island was called *Melita* or *Malta*; the inhabitants of which received them with great humanity, (Acts xxvii. 1, 2, 3, &c.).

They being all very wet and cold, a great fire was lighted to dry them; and Paul having gathered up a handful of sticks, and put them upon the fire, a viper leaped out of the fire, and took hold of his hand. Then the barbarous people said to one another, "Without doubt this man is a murderer; and though he has been saved from the shipwreck, yet divine vengeance still pursues him, and will not suffer him to live." But Paul, shaking the viper into the fire, received no injury from it. The people, seeing this, changed their opinion of him, and took him for a god; which opinion of theirs was more confirmed, by his curing the father of Publius, the chief man of the island, of a fever and bloody-flux. After this miracle, they all brought out their sick to him, and they were healed. See MELITA.

At the end of three months they embarked again; and arrived, first at Syracuse, then at Rhegium, and lastly at Puteoli. Here St Paul found some Christians, who detained him for seven days; then he set out for Rome. The brethren of this city having been informed of St Paul's arrival, came to meet him as far as Appii forum, and the Three Taverns. And when he was come to Rome, he was allowed to dwell where he pleased, having a soldier to guard him, who was joined to him with a chain. Three days afterwards, St Paul desired the chief of the Jews there to come to him. He related to them in what manner he had been seized in the temple of Jerusalem, and the necessity he was under of appealing to Cæsar. The Jews told him, that as yet they had received no information about his affair; and, as for Christianity, they knew nothing of it, but only that it was spoken against everywhere; however, that they should be very willing to have some account of that doctrine from him. A day was appointed for this purpose; when St Paul preached to them concerning the kingdom of God, endeavouring to convince them from Moses and the prophets, that Jesus was the Messiah. Some of them believed what he had said to them, while others disbelieved; so that they returned from him divided among themselves.

Paul dwelt for two whole years at Rome, from the year of Christ 61 to the year 63, in a lodging that he hired; where he received all that came to him, preaching the kingdom of God, and the religion of Jesus Christ, without any interruption.

Hitherto we have had the Acts of the Apostles for our guide, in compiling the history of St Paul; what we shall add hereafter, will be mostly taken from his own Epistles. His captivity did not a little contribute to the advancement of religion; for he converted several persons even of the emperor's court, (Philip. i. 12—18. and iv. 22.). The Christians of Philippi, in Macedonia, hearing that St Paul was a prisoner at Rome, sent Epaphroditus their bishop to him, to bring him money, and otherwise to assist him in their name, (Phil. ii. 25.). Epaphroditus fell sick at Rome; and when he went back to Macedonia, the apostle sent by him his Epistle to the Philippians.

It is not known by what means St Paul was delivered from his prison, and discharged from the accusation of the Jews. There is great probability that they durst not appear against him before the emperor, as not having sufficient proof of what they laid to his charge. However that may be, it is certain that he was set at liberty, after having been two years a prisoner at Rome. He wrote also, during this imprisonment, his Epistles to Philemon and the Colossians.

He was still in the city of Rome, or at least in Italy, when he wrote his Epistle to the Hebrews. St Paul, having got out of prison, went over Italy; and, according to some of the fathers, passed into Spain; then into Judea; went to Ephesus, and there left Timothy (Heb. xiii. 24. and 1 Tim. i. 3.); preached in Crete, and there fixed Titus, to take care to cultivate the church he

Paul.

he had planted in that place. Probably he might alſo viſit the Philippians, according to the promiſe he had made them, (Phil. i. 23. 26. and ii. 24.); and it is believed, that it was from Macedonia that he wrote the Firſt Epiſtle to Timothy.—Some time after, he wrote to Titus, whom he had left in Crete; he deſires him to come to Nicopolis, from whence, probably, he ſent this letter. The year following, that is, the 65th year of the Chriſtian era, the apoſtle went into Aſia, and came to Troas, (2 Tim. iv. 13.). Thence he went to viſit Timothy at Epheſus, and from that to Miletus, (2 Tim. iv. 20.). Laſtly, he went to Rome; and St Chryſoſtom ſays, that it was reported, that having converted a cup-bearer and a concubine of Nero, this ſo provoked the emperor, that he cauſed St Paul to be apprehended, and clapped into priſon. It was in this laſt place of confinement that he wrote his Second Epiſtle to Timothy, which Chryſoſtom looks upon as the apoſtle's laſt teſtament. See TIMOTHY and TITUS.

This great apoſtle at laſt conſummated his martyrdom, the 29th of June, in the 66th year of Jeſus Chriſt, by having his head cut off, at a place called the *Salvian Waters*. He was buried on the way of Oſtium, and a magnificent church was built over his tomb, which is in being to this day. *Calmet's Dict.* &c.

PAUL, *St*, *Cave or Grotto of*, in the iſland of Malta, where St Paul and his company took ſhelter from the rains, when the viper faſtened on his arm. Upon this ſpot there is a church built by the famed Alof de Vignacourt, grand-maſter of the order, in the year 1606, a very handſome, though but a ſmall, ſtructure. On the altar-piece is a curious painting, repreſenting the apoſtle's ſhaking off the viper, ſurrounded with men, women, and children, in attitudes of admiration and ſurpriſe, and in the old Malteſe garb; and the whole very well executed. On the top of the painting is the following inſcription:

Vipera ignis acta calore fruſtra Pauli
Manum invadit; is inſulæ benedicens
Anguibus et herbis adimit omne virus.
M.DC.V.

PAUL, firſt biſhop of Narbonne, or Sergius Paulus the proconſul, converted and made biſhop by St Paul, was deſcended from one of the beſt families of Rome. It is ſaid the apoſtle called himſelf *Paul*, from his name. The Spaniards will have him to be their apoſtle, which is not improbable; and it is ſaid he died a martyr at Narbonne.

PAUL V. by birth a Roman, was firſt clerk of the chamber, and afterwards nuncio to Clement VIII. in Spain, who honoured him with a cardinal's hat. He was advanced to the papal chair the 16th of May 1605, after Leo XI. The ancient quarrel between the ſecular and eccleſiaſtical juriſdictions, which in former times had ocaſioned ſo much bloodſhed, revived in the reign of this pontiff. The ſenate of Venice had condemned by two decrees, 1. The new foundations of monaſteries made without their concurrence. 2. The alienation of the eſtates both eccleſiaſtical and ſecular. The firſt decree paſſed in 1603, and the ſecond in 1605. About the ſame time a canon and abbot, accuſed of rapine and murder, were arreſted by order of the ſenate, and delivered over to the ſecular court; a circumſtance which could not fail to give offence to the court of Rome. Clement VIII. thought it proper to diſſemble or take no notice of the affair; but Paul V. who had managed the Genoeſe upon a ſimilar occaſion, flattered himſelf with the hopes that the Venetians would be equally pliant. However, he was diſappointed; for the ſenate maintained that they held their power to make laws of God only; and therefore they refuſed to revoke their decrees and deliver up the eccleſiaſtical priſoners into the hands of the nuncio, as the pope demanded. Paul, provoked at this behaviour, excommunicated the doge and ſenate; and threatened to put the whole ſtate under an interdict, if ſatisfaction was not given him within the ſpace of 14 hours. The ſenate did no more than proteſt againſt this menace, and forbid the publication of it throughout their dominions. A number of pamphlets, from both ſides, ſoon announced the animoſity of the two parties. The Capuchins, the Theatins, and Jeſuits, were the only religious orders who obſerved the interdict. The ſenate ſhipped them all off for Rome, and the Jeſuits were baniſhed for ever. Meantime his holineſs was preparing to make the refractory republic ſubmit to his ſpiritual tyranny by force of arms. He levied troops againſt the Venetians; but he ſoon found his deſign baulked, as the cauſe of the Venetians appeared to be the common cauſe of all princes. He had recourſe, therefore, to Henry IV. to ſettle the differences: and this prince had all the honour of bringing about a reconciliation between the contending parties. His ambaſſadors at Rome and Venice began the negotiation, and Cardinal de Joyeuſe finiſhed it in 1607. It was agreed upon, that this cardinal ſhould declare at his entry into the ſenate, that the cenſures of the church were to be taken off, or that he would remove them; and that the doge ſhould at the ſame time ſurrender to him the deeds of revocation and proteſt. It was alſo ſtipulated, that all the religious who were baniſhed, except the Jeſuits, ſhould be reſtored to their former privileges. In fine, the Venetians promiſed to ſend an ambaſſador extraordinary to Rome, in order to thank the pope for the favour he had done them; but they would not allow the legate to ſpeak of his holineſs granting them abſolution. Paul was wiſe enough to overlook the whole matter, but endeavoured to put an end to another diſpute, which had been long agitated in the congregations *de auxiliis*. He cauſed it to be intimated in form to the diſputants and counſellors, that, as the congregations were now diſſolved, it was his expreſs order that the contending parties ſhould no longer continue to cenſure one another. Some authors have affirmed that Paul V. had drawn out a bull againſt the doctrine of Molina, which only wanted to be promulged; but for this fact there appears to be no other evidence than the draught of this bull, which we meet with in the end of the hiſtory of the above-mentioned congregations. Paul was ſtrongly ſolicited, but in vain, to make *the immaculate conception of the holy virgin* an article of faith. He contented himſelf with fairly forbidding the contrary doctrine to be publicly taught, that he might not offend the Dominicans, who, at that time, maintained that ſhe was conceived, like other human creatures, in original ſin. His holineſs afterwards applied himſelf to the embelliſhing of Rome, and was at great pains to collect the works of the moſt eminent painters and engravers. Rome is indebted to him for its moſt beautiful fountains,

Paul. fountains, especially that where the water spouts out from an antique vase taken from the thermæ or hot-baths of Vespasian, and that which they call *aqua Paola*, an ancient work of Augustus, restored by Paul V. He brought water into it by an aqueduct 35 miles in length, after the example of Sixtus V. He completed the frontispiece of St Peter, and the magnificent palace of Mount Cavallo. He applied himself in a particular manner to the recovering and repairing ancient monuments, which he made to advance, as much as the nature of them would admit, the honour of Christianity; as appears from an elegant inscription placed upon a column of porphyry, taken from the temple of Peace, and bearing a beautiful statue of the Virgin, at the side of the church of St Mary the elder:

> "Impura falsi templa
> Quondam numinis
> Jubente mœsta perferebam Cæsare:
> Nunc læta veri
> Perferens matrem Dei
> Te, Paule, nullis obticebo sæculis."

His pontificate was honoured with several illustrious embassies. The kings of Japan, Congo, and other Indian princes, sent ambassadors to him. He took care to supply them with missionaries, and to found bishopricks in these countries newly brought over to the faith. He showed the same attention to the Maronites and other eastern Christians. He sent legates to different orthodox princes, both to testify his esteem for them, and to confirm them in their zeal for religion. He died the 28th of January 1621, aged 69; after having confirmed the French Oratory, the Ursulines, the Order of Charity, and some other institutions. Bold in his claims, but of narrow views, he distinguished himself more by his piety and knowledge than by his politics. It has been remarked, that he never passed a single day of his popedom without celebrating mass. He enjoined all the religious in the prosecution of their studies to have regular professors for Latin, Greek, Hebrew, and Arabic; if there were any among themselves properly qualified; or if that was not the case, to take the assistance of laymen for that purpose, until there were some of their own order who had learning enough to instruct their brethren. It was very difficult to carry this decree into execution; and indeed it was always very imperfectly observed.

PAUL, *Father*, whose name, before he entered into the monastic life, was Peter Sarpi, was born at Venice, August 14. 1552. His father followed merchandise, but with so little success, that at his death he left his family very ill provided for; but under the care of a mother whose piety was likely to bring the blessing of providence upon them, and whose wise conduct supplied the want of fortune by advantages of greater value. Happily for young Sarpi she had a brother, master of a celebrated school, under whose direction he was placed by her. Here he lost no time, but cultivated his abilities, naturally of the first rate, with unwearied application. He was born for study, having a natural aversion to pleasure and gaiety, and a memory so tenacious that he could repeat 30 verses upon once hearing them. Proportionable to his capacity was his progress in literature: at 13, having made himself master of school learning, he turned his studies to philosophy and the mathematics, and entered upon logic under Capella of Cremona, who, though a celebrated master of that science, confessed himself in a very little time unable to give his pupil any farther instructions. Paul.

As Capella was of the order of the Servites, his scholar was induced by his acquaintance with him to engage in the same profession, though his uncle and his mother represented to him the hardships and austerities of that kind of life, and advised him with great zeal against it. But he was steady in his resolutions, and in 1566 took the habit of the order, being then only in his 14th year, a time of life in most persons very improper for such engagements, but in him attended with such maturity of thought, and such a settled temper, that he never seemed to regret the choice he then made, and which he confirmed by a solemn public profession in 1572.

At a general chapter of the Servites held at Mantua, Paul (for so we shall now call him) being then only 20 years old, distinguished himself so much in a public disputation by his genius and learning, that William duke of Mantua, a great patron of letters, solicited the consent of his superiors to retain him at his court, and not only made him public professor of divinity in the cathedral, and reader of casuistical divinity and canon law in that city, but honoured him with many proofs of his esteem. But Father Paul finding a court life not agreeable to his temper, quitted it two years afterwards, and retired to his beloved privacies, being then not only acquainted with the Latin, Greek, Hebrew, and Chaldee languages, but with philosophy, the mathematics, canon and civil law, all parts of natural philosophy, and chemistry itself; for his application was unintermitted, his head clear, his apprehension quick, and his memory retentive.

Being made a priest at 22, he was distinguished by the illustrious Cardinal Borromeo with his confidence, and employed by him on many occasions, not without the envy of persons of less merit, who were so far exasperated as to lay a charge against him before the Inquisition, for denying that the Trinity could be proved from the first chapter of Genesis; but the accusation was too ridiculous to be taken notice of. After this he passed successively through the dignities of his order, of which he was chosen provincial for the province of Venice at 26 years of age; and discharged his post with such honour, that in 1579 he was appointed, with two others, to draw up new regulations and statutes for his order. This he executed with great success; and when his office of provincial was expired, he retired for three years to the study of natural and experimental philosophy and anatomy, in which he is said to have made some useful discoveries. In the intervals of his employment he applied himself to his studies with so extensive a capacity, as left no branch of knowledge untouched. By him Acquapendente, the great anatomist, confesses that he was informed how vision is performed; and there are proofs that he was not a stranger to the circulation of the blood. He frequently conversed upon astronomy with mathematicians, upon anatomy with surgeons, upon medicine with physicians, and with chemists upon the analysis of metals, not as a superficial inquirer, but as a complete master. He was then chosen procurator general of his order; and during his residence at Rome was greatly esteemed by Pope Sixtus V. and contracted an intimate

Paul. intimate friendship with Cardinal Bellarmine and other eminent persons.

But the hours of repose, which he employed so well, were interrupted by a new information in the Inquisition; where a former acquaintance produced a letter written by him in cyphers, in which he said, "that he detested the court of Rome, and that no preferment was obtained there but by dishonest means." This accusation, however dangerous, was passed over on account of his great reputation; but made such impressions on that court, that he was afterwards denied a bishopric by Clement VIII. After these difficulties were surmounted, F. Paul again retired to his solitude; where he appears, by some writings drawn up by him at that time, to have turned his attention more to improvement in piety than learning. Such was the care with which he read the scriptures, that, it being his custom to draw a line under any passage which he intended more nicely to consider, there was not a single word in his New Testament but was underlined. The same marks of attention appeared in his Old Testament, Psalter, and Breviary.

But the most active scene of his life began about the year 1615; when Pope Paul V. exasperated by some decrees of the senate of Venice that interfered with the pretended rights of the church, laid the whole state under an interdict. The senate, filled with indignation at this treatment, forbade the bishops to receive or publish the pope's bull; and, convening the rectors of the churches, commanded them to celebrate divine service in the accustomed manner, with which most of them readily complied: but the Jesuits and some others refusing, were by a solemn edict expelled the state. Both parties having proceeded to extremities, employed their ablest writers to defend their measures. On the pope's side, among others, Cardinal Bellarmine entered the lists, and, with his confederate authors, defended the papal claims with great scurrility of expression, and very sophistical reasonings; which were confuted by the Venetian apologists in much more decent language, and with much greater solidity of argument. On this occasion F. Paul was most eminently distinguished by his Defence of the Rights of the supreme Magistrate, his Treatise of Excommunication, translated from Gerson, with an Apology, and other writings; for which he was cited before the Inquisition at Rome; but it may be easily imagined that he did not obey the summons.

The Venetian writers, whatever might be the abilities of their adversaries, were at least superior to them in the justice of their cause. The propositions maintained on the side of Rome were these: That the pope is invested with all the authority of heaven and earth: that all princes are his vassals, and that he may annul their laws at pleasure: that kings may appeal to him, as he is temporal monarch of the whole earth: that he can discharge subjects from their oaths of allegiance, and make it their duty to take up arms against their sovereign: that he may depose kings without any fault committed by them, if the good of the church requires it: that the clergy are exempt from all tribute to kings, and are not accountable to them even in cases of high-treason: that the pope cannot err: that his decisions are to be received and obeyed on pain of sin, though all the world should judge them to be false: that the pope is God upon earth: that his sentence and that of God are the same: and that to call his power in question is to call in question the power of God: maxims equally shocking, weak, pernicious, and absurd; of which it did not require the abilities and learning of F. Paul to demonstrate the falsehood and destructive tendency. It may be easily imagined that such principles were quickly overthrown, and that no court but that of Rome thought it for its interest to favour them. The pope, therefore, finding his authors confuted and his cause abandoned, was willing to conclude the affair by treaty; which, by the mediation of Henry IV. of France, was accommodated upon terms very much to the honour of the Venetians. But the defenders of the Venetian rights, though comprehended in the treaty, were excluded by the Romans from the benefit of it: some, upon different pretences, were imprisoned; some sent to the galleys; and all debarred from preferment. But their malice was chiefly aimed against F. Paul, who soon felt the effects of it; for as he was going one night to his convent, about six months after the accommodation, he was attacked by five ruffians armed with stilettoes, who gave him no less than 15 stabs, three of which wounded him in such a manner that he was left for dead. The murderers fled for refuge to the nuncio, and were afterwards received into the pope's dominions; but were pursued by divine justice, and all, except one man who died in prison, perished by a violent death.

This, and other attempts upon his life, obliged him to confine himself to his convent, where he engaged in writing the History of the Council of Trent; a work unequalled for the judicious disposition of the matter, and artful texture of the narration; commended by Dr Burnet as the completest model of historical writing; and celebrated by Mr Worton as equivalent to any production of antiquity; in which the reader finds "liberty without licentiousness, piety without hypocrisy, freedom of speech without neglect of decency, severity without rigour, and extensive learning without ostentation."

In this, and other works of less consequence, he spent the remaining part of his life to the beginning of the year 1622, when he was seized with a cold and fever, which he neglected till it became incurable. He languished more than twelve months, which he spent almost wholly in a preparation for his passage into eternity; and among his prayers and aspirations was often heard to repeat, "Lord! now let thy servant depart in peace." On Sunday the eighth of January of the next year, he rose, weak as he was, to mass, and went to take his repast with the rest; but on Monday was seized with a weakness that threatened immediate death; and on Thursday prepared for his change, by receiving the viaticum, with such marks of devotion as equally melted and edified the beholders. Through the whole course of his illness to the last hour of his life he was consulted by the senate in public affairs, and returned answers in his greatest weakness with such presence of mind as could only arise from the consciousness of innocence.

On Saturday, the day of his death, he had the passion of our blessed Saviour read to him out of St John's gospel, as on every other day of that week, and spoke of the mercy of his Redeemer, and his confidence in his merits. As his end evidently approached, the brethren of his convent came to pronounce the last prayers, with which he could only join in his thoughts, being able to

pronounce no more than these words, *Esto perpetua*, "Mayest thou last for ever;" which was understood to be a prayer for the prosperity of his country. Thus died F. Paul, in the 71st year of his age; hated by the Romans as their most formidable enemy, and honoured by all the learned for his abilities, and by the good for his integrity. His detestation of the corruption of the Roman church appears in all his writings, but particularly in this memorable passage of one of his letters: "There is nothing more essential than to ruin the reputation of the Jesuits. By the ruin of the Jesuits, Rome will be ruined; and if Rome be ruined, religion will reform of itself." He appears, by many passages in his life, to have had a high esteem for the church of England; and his friend F. Fulgentio, who had adopted all his notions, made no scruple of administering to Dr Duncombe, an English gentleman who fell sick at Venice, the communion in both kinds, according to the Common Prayer which he had with him in Italian. F. Paul was buried with great pomp at the public charge, and a magnificent monument was erected to his memory.

Paul, in sea language, is a short bar of wood or iron, fixed close to the capstern or windlass of a ship, to prevent those engines from rolling back or giving way when they are employed to heave in the cable, or otherwise charged with any great effort.

PAULIANISTS, Paulianistæ, a sect of heretics, so called from their founder Paulus Samosatenus, a native of Samosata, elected bishop of Antioch in 262. His doctrine seems to have amounted to this: that the Son and the Holy Ghost exist in God in the same manner as the faculties of reason and activity do in man; that Christ was born a mere man; but that the reason or wisdom of the Father descended into him, and by him wrought miracles upon earth, and instructed the nations; and, finally, that on account of this union of the Divine Word with the man Jesus, Christ might, though improperly, be called God. It is also said, that he did not baptize in the name of the Father and the Son, &c.; for which reason the council of Nice ordered those baptized by him to be re-baptized.

Being condemned by Dionysius Alexandrinus in a council, he abjured his errors to avoid deposition; but soon after he resumed them, and was actually deposed by another council in 269.—He may be considered as the father of the modern Socinians; and his errors are severely condemned by the council of Nice, whose creed differs a little from that now used, under the same name, in the church of England. The creed agreed upon by the Nicene fathers, with a view to the errors of Paulus Samosatenus, concludes thus: τους δε λεγοντας ην ποτε ουκ ην και πριν γεννηθηναι, ουκ ην, &c. τουτους αναθεματιζει ἡ καθολικη και αποστολικη εκκλησια.——"But those who say there was a time when he was not, and that he was not before he was born, the catholic and apostolic church anathematizes." To those who have any veneration for the council of Nice this must appear a very severe, and perhaps not unjust, censure of some other modern sects as well as of the Socinians.

PAULICIANS, a branch of the ancient Manichees, so called from their founder, one Paulus, an Armenian, in the seventh century; who, with his brother John, both of Samosata, formed this sect: though others are of opinion, that they were thus called from another Paul, an Armenian by birth, who lived under the reign of Justinian II. In the seventh century a zealot called Constantine revived this drooping sect, which had suffered much from the violence of its adversaries, and was ready to expire under the severity of the imperial edicts, and that zeal with which they were carried into execution. The Paulicians, however, by their number, and the countenance of the emperor Nicephorus, became formidable to all the East.

But the cruel rage of persecution, which had for some years been suspended, broke forth with redoubled violence under the reigns of Michael Curopalates and Leo the Armenian, who inflicted capital punishment on such of the Paulicians as refused to return into the bosom of the church. The empress Theodora, tutoress of the emperor Michael, in 845, would oblige them either to be converted or to quit the empire: upon which several of them were put to death, and more retired among the Saracens; but they were neither all exterminated nor banished.

Upon this they entered into a league with the Saracens; and choosing for their chief an officer of the greatest resolution and valour, whose name was Carbeus, they declared against the Greeks a war which was carried on for fifty years with the greatest vehemence and fury. During these commotions, some Paulicians, towards the conclusion of this century, spread abroad their doctrines among the Bulgarians; many of them, either from a principle of zeal for the propagation of their opinions, or from a natural desire of flying from the persecution which they suffered under the Grecian yoke, retired, about the close of the eleventh century, from Bulgaria and Thrace, and formed settlements in other countries. Their first migration was into Italy; whence, in process of time, they sent colonies into almost all the other provinces of Europe, and formed gradually a considerable number of religious assemblies, who adhered to their doctrine, and who were afterwards persecuted with the utmost vehemence by the Roman pontiffs. In Italy they were called *Patarini*, from a certain place called *Pataria*, being a part of the city of Milan, where they held their assemblies; and *Gathari* or *Gazari*, from Gazaria, or the Lesser Tartary. In France they were called *Albigenses*, though their faith differed widely from that of the Albigenses, whom Protestant writers generally vindicate. (See Albigenses). The first religious assembly the Paulicians had formed in Europe is said to have been discovered at Orleans in 1017, under the reign of Robert, when many of them were condemned to be burnt alive. The ancient Paulicians, according to Photius, expressed the utmost abhorrence of Manes and his doctrine. The Greek writers comprise their errors under the six following particulars: 1. They denied that this inferior and visible world is the production of the Supreme Being; and they distinguish the Creator of the world and of human bodies from the most high God who dwells in the heavens: and hence some have been led to conceive that they were a branch of the Gnostics rather than of the Manichæans. 2. They treated contemptuously the Virgin Mary; or, according to the usual manner of speaking among the Greeks, they refused to adore and worship her. 3. They refused to celebrate the institution of the Lord's Supper. 4. They loaded the cross of Christ with contempt and reproach; by which we are only to understand, that they refused to follow

follow the abſurd and ſuperſtitious practice of the Greeks, who paid to the pretended wood of the croſs a certain ſort of religious homage. 5. They rejected, after the example of the greateſt part of the Gnoſtics, the books of the old Teſtament; and looked upon the writers of that ſacred hiſtory as inſpired by the Creator of this world, and not by the ſupreme God. 6. They excluded preſbyters and elders from all part in the adminiſtration of the church.

PAULINA, a Roman lady, wife of Saturnius governor of Syria, in the reign of the emperor Tiberius. Her conjugal peace was diſturbed, and violence was offered to her virtue, by a young man named Mundus, who fell in love with her, and had cauſed her to come to the temple of Iſis by means of the prieſts of that goddeſs, who declared that Anubis wiſhed to communicate to her ſomething of moment. Saturnius complained to the emperor of the violence which had been offered to his wife; and the temple of Iſis was overturned, and Mundus baniſhed, &c.—There was beſides a *Paulina*, wife of the philoſopher Seneca. She attempted to kill herſelf when Nero had ordered her huſband to die. The emperor, however, prevented her; and ſhe lived ſome few years after in the greateſt melancholy.

PAULINIA, a genus of plants belonging to the octandria claſs, and in the natural method ranking under the 23d order, *Trihilatæ*. See BOTANY *Index*.

PAULINUS, a biſhop who flouriſhed in the early part of the 7th century, He was the apoſtle of Yorkſhire, having been the firſt archbiſhop of York. This dignity ſeems to have been conferred on him about the year 626. He built a church at Almonbury, and dedicated it to St Alban, where he preached to and converted the Brigantes. Camden mentions a croſs at Dewſborough, which had been erected to him, with this inſcription, *Paulinus hic prædicavit et celebravit*. York was ſo ſmall about this time, that there was not ſo much as a ſmall church in it in which King Edwin could be baptized. Conſtantius is ſaid to have made it a biſhopric. Pope Honorius made it a metropolitan ſee. We are told that Paulinus baptized in the river Swale, in one day, 10,000 men, beſides women and children, on the firſt converſion of the Saxons to Chriſtianity, beſides many at Halyſtone. At Walſtone, in Northumberland, he baptized Segbert king of the Eaſt Saxons. Bede ſays, "Paulinus coming with the king and queen to the royal manor called *Ad Gebrin* (now Yeverin), ſtaid there 36 days with them, employed in the duties of catechizing and baptizing. In all this time he did nothing from morning to night but inſtruct the people, who flocked to him from all the villages and places, in the doctrine of Chriſt and ſalvation; and, after they were inſtructed, baptizing them in the neighbouring river Glen." According to the ſame Bede, "he preached the word in the province of Lindiffi; and firſt converted the governor of the city of Lindocollina, whoſe name was Blecca, with all his family. In this city he built a ſtone church of exquiſite workmanſhip, whoſe roof being ruined by long neglect or the violence of the enemy, only the walls are now ſtanding." He is alſo ſaid to have founded a collegiate church of prebends near Southwell, in Nottinghamſhire, dedicated to the Virgin Mary. This church he is ſaid to have built when he baptized the Coritani in the Trent.

PAULO, MARCO, a celebrated traveller, was ſon to Nicholas Paulo, a Venetian, who went with his brother Matthew, about the year 1255, to Conſtantinople, in the reign of Baudoin II. Nicholas, at his departure, left his wife big with child; and ſhe brought to the world the famous Marco Paulo, the ſubject of this memoir. The two Venetians, having taken leave of the emperor, croſſed the Black ſea, and travelled into Armenia; whence they paſſed over land to the court of Barka, one of the greateſt lords of Tartary, who loaded them with honours. This prince having been defeated by one of his neighbours, Nicholas and Matthew made the beſt of their way through the deſerts, and arrived at the city where Kublai, grand khan of the Tartars, reſided. Kublai was entertained with the account which they gave him of the European manners and cuſtoms; and appointed them ambaſſadors to the pope, in order to demand of his holineſs a hundred miſſionaries. They came accordingly to Italy, obtained from the Roman pontiff two Dominicans, the one an Italian, the other an Aſiatic, and carried along with them young Marco, for whom Kublai expreſſed a ſingular affection. This young man, having learned the different dialects of Tartary, was employed in embaſſies which gave him the opportunity of traverſing Tartary, China, and other eaſtern countries. At length, after a reſidence of ſeventeen years at the court of the grand khan, the three Venetians returned to their own country, in the year 1295, with immenſe fortunes. A ſhort time after his return, Marco ſerving his country at ſea againſt the Genoeſe, his galley, in a great naval engagement, was ſunk, and himſelf taken priſoner, and carried to Genoa. He remained there many years in confinement; and, as well to amuſe his melancholy as to gratify thoſe who deſired it from him, he ſent for his notes from Venice, and compoſed the hiſtory of his own and his father's voyages in Italian, under this title, *Delle maraviglie del mondo da lui vidute*, &c.; the firſt edition of which appeared at Venice, in 8vo, 1496. His work was tranſlated into different languages, and inſerted in various collections. The editions moſt eſteemed are the Latin one publiſhed by Andrew Muller at Cologne, in 4to, 1671; and that in French, to be found in the collection of voyages publiſhed by Bergeron, at the Hague, 1735, in 2 vols 4to. In the writings of Marco Paulo, there are ſome things true and others highly incredible. It is indeed difficult to believe, that as ſoon as the grand khan was informed of the arrival of two Venetian merchants, who were come to ſell theriaca (or treacle) at his court, he ſent before them an eſcort of 40,000 men, and afterwards diſpatched theſe Venetians ambaſſadors to the Pope, to beſeech his holineſs to ſend him a hundred miſſionaries. It is equally difficult to believe that the pope, who doubtleſs had an ardent zeal for the propagation of the faith, inſtead of a hundred, ſhould have ſent him only two miſſionaries. There are therefore ſome errors and exaggerations in Marco Paulo's narrative; but many other things which were afterwards verified, and which have been of ſervice to ſucceeding travellers, prove that in ſeveral reſpects his relation is valuable. He not only gave better accounts of China than had been before received; but likewiſe furniſhed a deſcription of Japan, of many of the iſlands of the Eaſt Indies, of Madagaſcar, and the coaſts of Africa; ſo that from his work it might be eaſily collected, that a direct paſſage by ſea to the Indies was not only poſſible, but practicable. It

 may

Paulo || Paufanias.

may be worth while to add, that, in the opinion of the authors of the Univerfal Hiftory, what he wrote from his own knowledge is both curious and true, fo that where he has erred his father and uncle muft have deceived him.

PAULUS ÆMILIUS. See *ÆMILIUS Paulus*.

PAVO, the PEACOCK; a genus of birds belonging to the order of gallinæ. See ORNITHOLOGY *Index*.

PAVO, in *Aftronomy*, a conftellation in the fouthern hemifphere, unknown to the ancients, and not vifible in our latitude. It confifts of 14 ftars, of which the names and fituations are as follows:

	Signs.	Longitude °	′	″	Latitude South. °	′	″	Magnitude.
The eye of the peacock	♑	20	0	3	36	11	18	2
In the breaft		24	41	51	46	56	21	3
In the right wing		18	41	38	45	52	34	3
In the middle		3	42	28	44	29	8	3
In the root of the tail, firft		3	53	24	44	6	13	5
5.								
fecond		2	42	11	41	37	9	5
third		3	55	22	39	3	23	4
fourth		5	11	3	37	10	46	6
fifth		0	49	34	38	54	14	5
fixth	♐	29	39	17	38	3	36	4
10.								
feventh		27	22	54	40	9	28	5
laft		24	7	44	41	28	2	4
In the right foot	♑	1	22	11	48	6	3	4
In the left foot		9	43	7	50	49	7	4

See ASTRONOMY.

PAVOR, a Roman deity, whofe worfhip was introduced by Tullus Hoftilius, who, in a panic, vowed a fhrine to him, and one to Pallor, *Palenefs*; and therefore they are found on the coins of that family.

PAUSANIA, in Grecian antiquity, a feftival in which were folemn games, wherein nobody contended but free-born Spartans; in honour of Paufanias the Spartan general, under whom the Greeks overcame the Perfians in the famous battle of Platæa.

PAUSANIAS, a Spartan king and general, who fignalized himfelf at the battle of Platæa againft the Perfians. The Greeks, very fenfible of his fervices, rewarded his merit with a tenth of the fpoils taken from the Perfians. He was afterwards appointed to command the Spartan armies, and he extended his conquefts in Afia; but the haughtinefs of his behaviour created him many enemies; and the Athenians foon obtained a fuperiority in the affairs of Greece.—Paufanias, diffatisfied with his countrymen, offered to betray Greece to the Perfians, if he received in marriage as the reward of his perfidy the daughter of their king. His intrigues were difcovered by means of a young man who was intrufted with his letters to Perfia, and who refufed to go, on recollecting that fuch as had been employed in that office before had never returned. The letters were given to the Ephori of Sparta, and the perfidy of Paufanias was thus difcovered. He fled for fafety to a temple of Minerva; and as the fanctity of the place fcreened him from the violence of his purfuers, the facred building was furrounded with heaps of ftones, the firft of which was carried there by the indignant mother of the unhappy man. He was ftarved to death in the temple, and died about 474 years before the Chriftian era. There was a feftival and folemn games inftituted to his honour, in which only free-born Spartans contended. There was alfo an oration fpoken in his praife, in which his actions were celebrated, particularly the battle of Platæa, and the defeat of Mardonius. See PAUSANIA.

Paufanias || Peace.

PAUSANIAS, a learned Greek hiftorian and orator, in the fecond century, under the reign of Antoninus the Philofopher, was the difciple of Herodus Atticus. He lived for a long time in Greece; and afterwards went to Rome, where he died at a great age. He wrote an excellent defcription of Greece, in ten books; in which we find not only the fituation of places, but the antiquities of Greece, and every thing moft curious and worthy of knowledge. Abbe Gedoin has given a French tranflation of it, in 2 vols 4to.

PAUSE, a ftop or ceffation in fpeaking, finging, playing, or the like. One ufe of pointing in grammar is to make proper paufes, in certain places.—There is a paufe in the middle of each verfe; in an hemiftich, it is called a *reft* or *repofe*. See POETRY, and READING.

PAW, in the manege. A horfe is faid to paw the ground, when, his leg being either tired or painful, he does not reft it upon the ground, and fears to hurt himfelf as he walks.

PAWN, a pledge or gage for furety of payment of money lent. It is faid to be derived *à pugno, quia res quæ pignori dantur, pugno vel manu traduntur*. The party that pawns goods hath a general property in them; they cannot be forfeited by the party that hath them in pawn for any offence of his, nor be taken in execution for his debt; neither may they otherwife be put in execution till the debt for which they are pawned is fatisfied.

If the pawn is laid up, and the pawnee robbed, he is not anfwerable; though if the pawnee ufe the thing, as a jewel, watch, &c. that will not be the worfe for wearing, which he may do, it is at his peril; and if he is robbed, he is anfwerable to the owner, as the ufing occafioned the lofs, &c.

If the pawn is of fuch a nature that the keeping is a charge to the pawnee, as a cow or a horfe, &c. he may milk the one and ride the other, and this fhall go in recompenfe for his keeping.

Things which will grow the worfe by ufing, as apparel, &c. he may not ufe.

PEA, in *Botany*. See PISUM.

PEACE, TEMPLE OF, a celebrated temple at Rome, which was confumed by fire A. D. 191; produced, as fome writers fuppofe, by a flight earthquake, for no thunder was heard at the time. Dio Caffius, however, fuppofes that it began in the adjoining houfes. Be that as it will, the temple, with all the furrounding buildings, was reduced to afhes. That magnificent ftructure had been raifed by Vefpafian after the deftruction of Jerufalem, and enriched with the fpoils and ornaments of the temple of the Jews. The ancients fpeak of it as one of the moft ftately buildings in Rome. There men of learning ufed to hold their affemblies, and lodge their writings, as many others depofited their jewels, and whatever elfe they efteemed of great value. It was likewife

likewiſe made uſe of as a kind of magazine for the ſpices that were brought by the Roman merchants out of Egypt and Arabia; ſo that many rich perſons were reduced to beggary, all their valuable effects and treaſures being conſumed in one night, with the temple.

PEACH. See AMYGDALUS, BOTANY and GARDENING *Index*.

PEACOCK. See PAVO, ORNITHOLOGY *Index*.

PEAK OF DERBYSHIRE, a chain of very high mountains in the county of Derby in England, famous for the mines they contain, and for their remarkable caverns. The moſt remarkable of theſe are Pool's-hole and Elden-hole. The former is a cave at the foot of a high hill called *Coitmoſs*, ſo narrow at the entrance that paſſengers are obliged to creep on all-fours; but it ſoon opens to a conſiderable height, extending to above a quarter of a mile, with a roof ſomewhat reſembling that of an ancient cathedral. By the petrifying water continually dropping in many parts of the cave are formed a variety of curious figures and repreſentations of the works both of nature and art. There is a column here as clear as alabaſter, which is called *The Queen of Scots' Pillar*, becauſe Queen Mary is ſaid to have proceeded thus far when ſhe viſited the cavern. It ſeems the curioſity of that princeſs had led her thus far into this dark abode; and indeed there are few travellers who care to venture farther; but others, determined to ſee the end of all, have gone beyond it. After ſliding down the rock a little way, is found the dreary cavity turned upwards: following its courſe, and climbing from crag to crag, the traveller arrives at a great height, till the rock, cloſing over his head on all ſides, puts an end to any further ſubterraneous journey. Juſt at turning to deſcend, the attention is caught by chaſm, in which is ſeen a candle glimmering at a vaſt depth underneath. The guides ſay, that the light is at a place near Mary Queen of Scots' pillar, and no leſs than 80 yards below. It appears frightfully deep indeed to look down; but perhaps does not meaſure any thing like what it is ſaid to do. If a piſtol is fired by the Queen of Scots' pillar, it will make a report as loud as a cannon. Near the extremity there is a hollow in the roof, called the *Needle's Eye*; in which if a candle is placed, it will repreſent a ſtar in the firmament to thoſe who are below. At a little diſtance from this cave is a ſmall clear ſtream conſiſting of hot and cold water, ſo near each other, that the finger and thumb of the ſame hand may be put, the one into the hot water and the other into the cold.

Elden-hole is a dreadful chaſm in the ſide of a mountain; which, before the latter part of the laſt century, was thought to be altogether unfathomable. In the time of Queen Elizabeth, a poor man was let down into it for 200 yards; but he was drawn up in a frenzy, and ſoon after died. In 1682, it was examined by Captain Collins, and in 1699 by Captain Sturmy, who publiſhed their accounts in the Philoſophical Tranſactions. The latter deſcended by ropes fixed at the top of an old lead-ore pit, four fathoms almoſt perpendicular, and from thence three fathoms more obliquely, between two great rocks. At the bottom of this he found an entrance into a very ſpacious cavern, from whence he deſcended along with a miner for 25 fathoms perpendicular. At laſt they came to a great river or water, which he found to be 20 fathoms broad and eight fathoms deep. The miner who accompanied him, inſiſted that this water ebbed and flowed with the ſea; but the Captain diſproved this aſſertion, by remaining in the place from three hours flood to two hours ebb, during which time there was no alteration in the height of the water. As they walked by the ſide of this water, they obſerved a hollow in the rock ſome feet above them. The miner went into this place, which was the mouth of another cavern; and walked for about 70 paces in it, till he juſt loſt ſight of the Captain. He then called to him, that he had found a rich mine; but immediately after came running out and crying, that he had ſeen an evil ſpirit; neither could any perſuaſions induce him to return. The floor of theſe caverns is a kind of white ſtone enamelled with lead ore, and the roofs are encruſted with ſhining ſpar. On his return from this ſubterraneous journey, Captain Sturmy was ſeized with a violent headach, which, after continuing four days, terminated in a fever, of which he died in a ſhort time.

PEAK *of Teneriffe*. See TENERIFFE.

PEAN, in *Heraldry*, is when the field of a coat of arms is ſable, and the powderings or.

PEAR. See PYRUS, BOTANY and GARDENING *Index*.

PEAR-*Glaſs*. See VITREA *Lacryma*.

PEARCE, DR, lord biſhop of Rocheſter, was the ſon of a diſtiller in High Holborn. He married Miſs Adams, the daughter of a diſtiller in the ſame neighbourhood, with a conſiderable fortune, who lived with him 52 years in the higheſt degree of connubial happineſs. He had his education in Weſtminſter ſchool, where he was diſtinguiſhed by his merit, and elected one of the king's ſcholars. In 1710, when he was 20 years old, he was elected to Trinity College, Cambridge. During the firſt years of his reſidence at the univerſity, he ſometimes amuſed himſelf with lighter compoſitions, ſome of which are inſerted in the Guardian and Spectator. In 1716, he publiſhed his edition of *Cicero de Oratore*, and, at the deſire of a friend, luckily dedicated it to Lord Chief Juſtice Parker (afterwards Earl of Macclesfield), to whom he was a ſtranger. This incident laid the foundation of his future fortune; for Lord Parker ſoon recommended him to Dr Bentley, maſter of Trinity, to be made one of the fellows; and the doctor conſented to it on this condition, that his lordſhip would promiſe to *unmake* him again as ſoon as it lay in his power to give him a living. In 1717, Mr Pearce was ordained at the age of 27; having taken time enough, as he thought, to attain a ſufficient knowledge of the ſacred office. In 1718, Lord Parker was appointed chancellor, and invited Mr Pearce to live with him in his houſe as chaplain. In 1719, he was inſtituted into the rectory of Stapleford Abbots, in Eſſex; and in 1720, into that of St Bartholomew, behind the Royal Exchange, worth 400l. *per annum*. In 1723, the lord chancellor preſented him to St Martin's in the Fields. His Majeſty, who was then at Hanover, was applied to in favour of St Claget, who was then along with him: and the doctor actually kiſſed hands upon the occaſion; but the chancellor, upon the king's return, diſputed

Pearce.

puted the point, and was permitted to present Mr Pearce.—Mr Pearce soon attracted the notice and esteem of persons in the highest stations and of the greatest abilities. Besides Lord Parker, he could reckon amongst his patrons or friends, Lord Macclesfield, Mr Pulteney (afterwards Earl of Bath), Archbishop Potter, Lord Hardwicke, Sir Isaac Newton, and other illustrious personages.—In 1724, the degree of doctor of divinity was conferred on him by Archbishop Wake. The same year he dedicated to his patron, the earl of Macclesfield, his edition of *Longinus on the Sublime*, with a new Latin version and notes.

When the church of St Martin's was rebuilt, Dr Pearce preached a sermon at the consecration, which he afterwards printed, and accompanied with an essay on the origin and progress of temples, traced from the rude stones which were first used for altars to the noble structure of Solomon, which he considers as the first temple completely covered. His observations on that building which is called the *Temple of Dagon* removes part of the difficulty which presents itself in the narration of the manner in which Samson destroyed it.

The deanery of Winchester becoming vacant, Dr Pearce was appointed dean in 1739; and in the year 1744 he was elected prolocutor of the lower house of convocation for the province of Canterbury. His friends now began to think of him for the episcopal dignity; but Mr Dean's language rather declined it. However, after several difficulties had been started and removed, he consented to accept the bishopric of Bangor, and promised Lord Hardwicke to do it with a good grace. He accordingly made proper acknowledgements of the royal goodness, and was consecrated Feb. 12. 1748. Upon the declining state of health of Dr Wilcocks, bishop of Rochester, the bishop of Bangor was several times applied to by Archbishop Herring to accept of Rochester, and the deanery of Westminster, in exchange for Bangor; but the bishop then first signified his desire to obtain leave to resign and retire to a private life. His lordship, however, upon being pressed, suffered himself to be prevailed upon.—"My Lord (said he to the duke of Newcastle), your grace offers these dignities to me in so generous and friendly a manner, that I promise you to accept them." Upon the death of Bishop Wilcocks he was accordingly promoted to the see of Rochester and deanery of Westminster in 1756. Bishop Sherlock died in 1761, and Lord Bath offered his interest for getting the bishop of Rochester appointed to succeed him in the diocese of London; but the bishop told his lordship, that he had determined never to be bishop of London or archbishop of Canterbury.

In the year 1763, his lordship being 73 years old, and finding himself less fit for the business of his stations as bishop and dean, informed his friend Lord Bath of his intention to resign both, and live in a retired manner upon his private fortune. Lord Bath undertook to acquaint his majesty; who named a day and hour, when the bishop was admitted alone into the closet. He told the king, that he wished to have some interval between the fatigues of business and eternity; and desired his majesty to consult proper persons about the propriety and legality of his resignation. In about two months the king informed him, that Lord Mansfield saw no objection; and that Lord Northington, who had been doubtful, on further consideration thought that the request might be complied with. Unfortunately for the bishop, Lord Bath applied for Bishop Newton to succeed. This alarmed the ministry, who thought that no dignities should be obtained but through their hands. They therefore opposed the resignation; and his majesty was informed that the bishops disliked the design. His majesty sent to him again; and at a third audience told him, that he must think no more of resigning. The bishop replied, "Sire, I am all duty and submission;" and then retired.

In 1768 he obtained leave to resign the deanery; in 1773, he lost his lady; and after some months of lingering decay, he died at Little Ealing, June 29. 1774.

This eminent prelate distinguished himself in every part of his life by the virtues proper to his station. His literary abilities, and application to sacred and philological learning, appear by his works; the principal of which are, A letter to the clergy of the church of England, on occasion of the bishop of Rochester's commitment to the Tower, 2d edit. 1722. Miracles of Jesus vindicated, 1727 and 1728. A review of the text of Milton, 1733. Two letters against Dr Middleton, occasioned by the doctor's letter to Waterland, on the publication of his treatise, intitled, *Scripture Vindicated*, 3d edit. 1752. And since his death, a commentary with notes on the four Evangelists and the acts of the Apostles, together with a new translation of St Paul's first Epistle to the Corinthians, with a paraphrase and notes, have been published, with his life prefixed, from original MSS. in 2 vols 4to.

The following character of this excellent bishop was published in the Gentleman's Magazine for 1775, and was written, as we are told, by a contemporary and friend. "The world has not lost for many years a more respectable member of society than the late Dr Pearce; nor the clergy a more pious and learned prelate. In his younger days, before he became a graduate, he published that excellent edition of Longinus, still admired and quoted by the best critics. What is said of Longinus himself by our excellent English poet, is as applicable to the editor: 'He is himself the great sublime he draws;' for very few of his order ever arrived at that perfection in eloquence, for which he was so justly celebrated. His diction was simple, nervous, and flowing; his sentiments were just and sublime; more sublime than the heathen critic, in proportion to the superior sublimity of the Christian revelation. Yet he was never puffed up with the general applauses of the world, but of an humble deportment, resembling the meek Jesus as far as the weakness of human nature can resemble a character without sin. His countenance was always placid, and displayed the benevolence of his heart, if his extensive charity had not proved it to a demonstration. His thirst of knowledge prompted him to a very studious life, and that rendered both his complexion and constitution delicate; yet it held out by the blessing of Providence beyond the 85th year of his age; which is the more extraordinary, considering the midnight lamp had cast a paleness over his complexion; yet with all his learning and knowledge, his humility and modesty restrained him from many publications, which the world may hope for from his executors; one particularly in divinity, which has been the object of his contemplation for many years past.

paſt. With a view to complete that work, and to retire from the buſtle of the world, he ſtruggled ſo hard to reſign his biſhopric, &c. After poſſeſſing the eſteem and veneration of all who knew him for a long ſeries of years, either as rector of a very large pariſh, or as a dignitary of the church, he has left the world in tears; and gone to receive the infinite reward of his piety and virtue."

PEARCH. See PERCA, ICHTHYOLOGY *Index*.

PEARCH-Glue, the name of a kind of glue, of remarkable ſtrength and purity, made from the ſkins of pearches.

PEARL, in *Natural Hiſtory*, a hard, white, ſhining body, uſually roundiſh, found in a teſtaceous fiſh, a ſpecies of *Mya;* which ſee, CONCHOLOGY *Index*.

Pearls, though eſteemed of the number of gems, and highly valued in all ages, proceed only from a diſtemper in the animal that produces them, analogous to the bezoars and other ſtony concretions in ſeveral animals of other kinds. For an account of the mode of formation of the pearl, ſee CONCHOLOGY, p. 476; for the hiſtory of the pearl fiſhery in the bay of Condatchy in Ceylon, ſee CEYLON, p. 363; ſee alſo Cordiner's Hiſtory of that iſland, 4to.

Mr Bruce mentions a muſcle found in the ſalt ſprings of the Nubian deſert; in many of which he found theſe excreſcences which might be called pearls, but all of them ill formed, foul, and of a bad colour, though of the ſame conſiſtence, and lodged in the ſame part of the body as thoſe in the ſea. "The muſcle, too (ſays our author), is in every reſpect ſimilar, I think larger. The outer ſkin or covering of it is of a vivid green. Upon removing this, which is the epidermis, what next appears is a beautiful pink without gloſs, and ſeemingly of a calcareous nature. Below this, the mother-of-pearl, which is undermoſt, is a white without luſtre, partaking much of the blue and very little of the red; and this is all the difference I obſerved between it and the pearl-bearing muſcle of the Red ſea."

"In Scotland, eſpecially to the northward, in all rivers running from lakes, there are found muſcles that have pearls of more than ordinary merit, though ſeldom of large ſize. They were formerly tolerably cheap, but lately the wearing of real pearls coming into faſhion, thoſe of Scotland have increaſed in price greatly beyond their value, and ſuperior often to the price of oriental ones when bought in the eaſt. The reaſon of this is a demand from London, where they are actually employed in work, and ſold as oriental. But the excellency of all glaſs or paſte manufactory, it is likely, will keep the price of this article, and the demand for it, within bounds, when every lady has it in her power to wear in her ears, for the price of ſixpence, a pearl as beautiful in colour, more elegant in form, lighter and eaſier to carry, and as much bigger as ſhe pleaſes, than the famous ones of Cleopatra and Servilia. In Scotland, as well as in the eaſt, the ſmooth and perfect ſhell rarely produces a pearl; the crooked and diſtorted ſhell ſeldom wants one.

The mother-of-pearl manufactory is brought to the greateſt perfection at Jeruſalem. The moſt beautiful ſhell of this kind is that of the peninim already mentioned; but it is too brittle to be employed in any large pieces of workmanſhip; whence that kind named *dora* is moſt uſually employed; and great quantities of this are daily brought from the Red ſea to Jeruſalem. Of theſe, all the fine works, the crucifixes, the wafer-boxes, and the beads, are made, which are ſent to the Spaniſh dominions in the New World, and produce a return incomparably greater than the ſtaple of the greateſt manufactory in the Old.

Very little is known of the natural hiſtory of the pearl fiſh. Mr Bruce ſays, that, as far as he has obſerved, they are all ſtuck upright in the mud by an extremity; the muſcle by one end, the pinna by the ſmall ſharp point, and the third by the hinge or ſquare part which projects from the round. "In ſhallow and clear ſtreams (ſays Mr Bruce), I have ſeen ſmall furrows or tracks upon the ſandy bottom, by which you could trace the muſcle from its laſt ſtation; and theſe not ſtraight, but deviating into traverſes and triangles, like the courſe of a ſhip in a contrary wind laid down upon a map, probably in purſuit of food. The general belief is, that the muſcle is conſtantly ſtationary in a ſtate of repoſe, and cannot transfer itſelf from place to place. This is a vulgar prejudice, and one of thoſe facts that are miſtaken for want of ſufficient pains or opportunity to make more critical obſervations. Others, finding the firſt opinion a falſe one, and that they are endowed with power of changing place like other animals, have, upon the ſame foundation, gone into the contrary extreme, ſo far as to attribute ſwiftneſs to them, a property ſurely inconſiſtent with their being fixed to rocks. Pliny and Solinus ſay that the muſcles have leaders, and go in flocks; and that their leader is endowed with great cunning to protect himſelf and his flock from the fiſhers; and that, when he is taken, the others fall an eaſy prey. This, however, we may juſtly look upon to be a fable; ſome of the moſt accurate obſervers having diſcovered the motion of the muſcle, which indeed is wonderful, and that they lie in beds, which is not at all ſo, have added the reſt, to make their hiſtory complete." Our author informs us, that the muſcles found in the ſalt ſprings of Nubia likewiſe travel far from home, and are ſometimes ſurpriſed, by the ceaſing of the rains, at a greater diſtance from their beds than they have ſtrength and moiſture to carry them. He aſſures us, that none of the pearl-fiſh are eatable; and that they are the only fiſh he ſaw in the Red ſea that cannot be eaten.

Artificial PEARLS. Attempts have been made to take out ſtains from pearls, and to render the foul opaque-coloured ones equal in luſtre to the oriental. Numerous proceſſes are given for this purpoſe in books of ſecrets and travels; but they are very far from anſwering what is expected from them. Pearls may be cleaned indeed from any external foulneſſes by waſhing and rubbing them with a little Venice ſoap and warm water, or with ground rice and ſalt, with ſtarch and powder blue, plaſter of paris, coral, white vitriol and tartar, cuttle-bone, pumice-ſtone, and other ſimilar ſubſtances; but a ſtain that reaches deep into the ſubſtance of pearls is impoſſible to be taken out. Nor can a number of ſmall pearls be united into a maſs ſimilar to an entire natural one, as ſome pretend.

There are, however, methods of making artificial pearls, in ſuch manner as to be with difficulty diſtinguiſhed from the beſt oriental. The ingredient uſed for this purpoſe was long kept a ſecret; but it is now diſcovered to be a fine ſilver-like ſubſtance found upon the under ſide of the ſcales of the blay or bleak fiſh. The ſcales, taken off in the uſual manner, are waſhed and rubbed

rubbed with freſh parcels of fair water, and the ſeveral liquors ſuffered to ſettle: the water being then poured off, the pearly matter remains at the bottom, of the conſiſtence of oil, called by the French *eſſence d'orient*. A little of this is dropped into a hollow bead of bluiſh glaſs, and ſhaken about ſo as to line the internal ſurface; after which the cavity is filled up with wax, to give ſolidity and weight. Pearls made in this manner are diſtinguiſhable from the natural only by their having fewer blemiſhes.

*Mother-of-*PEARL, the ſhell, not of the pearl oyſter, but of the *mytilus margaritiferus*. See MYTILUS, CONCHOLOGY *Index*.

PEARL *Aſh*, a fixed alkaline ſalt, prepared chiefly in Germany, Ruſſia, and Poland, by melting the ſalts out of the aſhes of burnt wood; and having reduced them again to dryneſs, evaporating the moiſture, and calcining them for a conſiderable time in a furnace moderately hot. The goodneſs of pearl-aſhes muſt be diſtinguiſhed by a uniform and white appearance, they are nevertheleſs ſubject to a common adulteration, not eaſy to be diſtinguiſhed by the mere appearance: which is done by the addition of common ſalt. In order to find out this fraud, take a ſmall quantity of the ſuſpected ſalt; and after it has been ſoftened by lying in the air, put it over the fire in a ſhovel: if it contains any common ſalt, a crackling and ſlight exploſion will take place as the ſalt grows hot.

Pearl-aſhes are much uſed in the manufacture of glaſs, and require no preparation, except where very great tranſparency is required, as in the caſe of looking glaſs, and the beſt kind of window-glaſs. For this purpoſe diſſolve them in four times their weight of boiling water: when they are diſſolved, let the ſolution be put into a clean tub, and ſuffered to remain there 24 hours or more. Let the clear part of the fluid be then decanted off from the ſediment, and put back into the iron pot in which the ſolution was made; in this let the water be evaporated till the ſalts be left perfectly dry. Keep thoſe that are not deſigned for immediate uſe in ſtone jars, well ſecured from moiſture and air.

Mr Kirwan, who inſtituted a ſet of experiments on the alkaline ſubſtances uſed in bleaching, &c. (ſee *Iriſh Tranſact.* for 1789), tells us, that in 100 parts of the Dantzick pearl-aſh, the vegetable alkali amounted to ſomewhat above 63. His pearl-aſh he prepares by calcining a ley of vegetable aſhes dried into a ſalt to whiteneſs. In this operation, he ſays, "particular care ſhould be taken that it ſhould not melt, as the extractive matter would not be thoroughly conſumed, and the alkali would form ſuch a union with the earthy parts as could not eaſily be diſſolved." He has "added this caution, as Dr Lewis and Mr Doſſie have inadvertently directed the contrary." We apprehend, however, that here is a little inaccuracy; and that it was not for pearl-aſh, but for the unrefined pot-aſh, that theſe gentlemen directed fuſion. The fact is, that the American pot-aſhes, examined by them, had unqueſtionably ſuffered fuſion; which was effected in the ſame iron pot in which the evaporation was finiſhed, by rather increaſing the fire at the end of the proceſs: by this management, one of the moſt troubleſome operations in the whole manufacture, the ſeparation of the hard ſalt from the veſſels with hammers and chiſſels, was avoided; and though the extractive matter was not conſumed, it was burnt to an indiſſoluble coal; ſo that the ſalt, though black itſelf, produced a pale or colourleſs ſolution, and was uncommonly ſtrong. Mr Kirwan has alſo given tables of the quantities of aſhes and ſalt obtained from different vegetables; and he concludes from them, 1. "That in general weeds yield much more aſhes, and their aſhes much more ſalt, than woods; and that conſequently, as to ſalts of the vegetable alkali kind, neither America, Trieſte, nor the northern countries, poſſeſs any advantage over us. 2. That of all weeds, fumitory produces moſt ſalt, and next to it wormwood; but if we attend only to the quantity of ſalt in a given weight of aſhes, the aſhes of wormwood contain moſt. *Trifolium fibrinum* alſo produces more aſhes and ſalt than fern." See POTASH.

PEARSON, JOHN, a very learned Engliſh biſhop in the 17th century, was born at Snoring in 1613. After his education at Eton and Cambridge, he entered into holy orders in 1639, and was the ſame year collated to the prebend of Netherhaven in the church of Sarum. In 1640 he was appointed chaplain to the lord-keeper Finch, and by him preſented to the living of Torrington in Suffolk. In 1650 he was made miniſter of St Clement's, Eaſt Cheap, in London. In 1657, he and Mr Gunning had a diſpute with two Roman Catholics upon the ſubject of ſchiſm; a very unfair account of which was printed at Paris in 1658. Some time after, he publiſhed at London An Expoſition of the Creed, in folio, dedicated to his pariſhioners of St Clement's Eaſt-Cheap, to whom the ſubſtance of that excellent work had been preached ſeveral years before, and by whom he had been deſired to make it public. The ſame year he likewiſe publiſhed The Golden Remains of the ever memorable Mr John Hales of Eton; to which he prefixed a preface, containing, of that great man, with whom he had been acquainted for many years, a character drawn with great elegance and force. Soon after the Reſtoration, he was preſented by Juxon, then biſhop of London, to the rectory of St Chriſtopher's in that city; created doctor of divinity at Cambridge, in purſuance of the king's letters mandatory; inſtalled prebendary of Ely, archdeacon of Surry; and made maſter of Jeſus college in Cambridge: all before the end of the year 1668. March 25th 1661, he was appointed Margaret profeſſor of divinity in that univerſity; and, the firſt day of the enſuing year, was nominated one of the commiſſioners for the review of the liturgy in the conference at the Savoy. April 14th 1662, he was admitted maſter of Trinity college in Cambridge; and, in Auguſt, reſigned his rectory of St Chriſtopher's and prebend of Sarum.—In 1667 he was admitted a Fellow of the Royal Society. In 1672 he publiſhed at Cambridge, in 4to, *Vindiciæ Epiſtolarum S. Ignatii*, in anſwer to Monſ. Daillé; to which is ſubjoined, *Iſaaci Voſſii epiſtolæ duæ adverſus Davidem Blondellum*. Upon the death of the celebrated Wilkins, Pearſon was appointed his ſucceſſor in the ſee of Cheſter, to which he was conſecrated February 9th 1672-3. In 1682, his *Annales Cyprianici, ſive tredecim annorum, quibus S. Cyprian, inter Chriſtianos verſatus eſt, hiſtoria chronologica*, was publiſhed at Oxford, with Fell's edition of that Father's works. Pearſon was diſabled from all public ſervice by ill health a conſiderable time before his death, which happened at Cheſter, July 16. 1686.

PEASANT, a hind, one whoſe buſineſs is in rural labour.

Peafant.

It is amongft this order of men that a philofopher would look for innocent and ingenuous manners. The fituation of the peafantry is fuch as fecludes them from the devaftations of luxury and licentioufnefs; for when the contagion has once reached the receffes of rural retirement, and corrupted the minds of habitual innocence, that nation has reached the fummit of vice, and is haftening to that decay which has always been the effect of vicious indulgence. The peafantry of this country ftill in a great meafure retain that fimplicity of manners and ruftic innocence which ought to be the characteriftic of this order of fociety; and, in many parts, their condition is fuch as, were all its advantages fufficiently known, would create envy in the minds of thofe who have toiled through life, amidft the buftle of the world, in queft of that happinefs which it could not confer.

O fortunatos nimium, fua fi bona norint,
Agricolas.—— VIRGIL.

In other countries the peafants do not enjoy the fame liberty as they do in our own, and are confequently not fo happy. In all feudal governments they are abject flaves, entirely at the difpofal of fome petty defpot. This was the cafe in Poland, where the native peafants were fubject to the moft horrid flavery, though thofe defcended of the Germans, who fettled in Poland during the reign of Boleflaus the Chafte and Caffimir the Great, enjoyed very diftinguifhed privileges. Amongft the native flaves, too, thofe of the crown were in a better condition than thofe of individuals. See POLAND.

The peafants of Ruffia (Mr Coxe tells us) are a hardy race of men, and of great bodily ftrength. Their cottages are conftructed with tolerable propriety, after the manner of thofe in Lithuania; but they are very poorly furnifhed. The peafants are greedy of money, and, as the fame author informs us, fomewhat inclined to thieving. They afford horfes to travellers, and act the part of coachmen and poftilions. "In their common intercourfe they are remarkably polite to each other: they take off their cap at meeting; bow ceremonioufly and frequently, and ufually exchange a falute. They accompany their ordinary difcourfe with much action, and innumerable geftures; and are exceedingly fervile in their expreffions of deference to their fuperiors: in accofting a perfon of confequence, they proftrate themfelves, and even touch the ground with their heads. We were often ftruck at receiving this kind of eaftern homage, not only from beggars, but frequently from children, and occafionally from fome of the peafants themfelves.

Coxe's Travels into Poland, Ruffia, Sweden, and Denmark.

"The peafants are well clothed, comfortably lodged, and feem to enjoy plenty of wholefome food. Their rye-bread, whofe blacknefs at firft difgufts the eye, and whofe fournefs the tafte, of a delicate traveller, agrees very well with the appetite: as I became reconciled to it from ufe, I found it at all times no unpleafant morfel, and, when feafoned with hunger, it was quite delicious: they render this bread more palatable, by fluffing it with onions and groats, carrots or green corn, and feafoning it with fweet oil. The rye-bread is fometimes white, and their other articles of food are eggs, falt-fifh, bacon, and mufhrooms; their favourite difh is a kind of hodge podge, made of falt or fometimes frefh meat, groats, rye-flour, highly feafoned with onions and garlick, which latter ingredients are much ufed by the Ruffians. Befides, mufhrooms are fo exceedingly common in thefe regions, as to form a very effential part of their provifion. I feldom entered a cottage without feeing great abundance of them; and in paffing through the markets, I was often aftonifhed at the prodigious quantity expofed for fale: their variety was no lefs remarkable than their number; they were of many colours, amongft which I particularly noticed white, black, brown, yellow, green and pink. The common drink of the peafants is quafs, a fermented liquor, fomewhat like fweet wort, made by pouring warm water on rye or barley meal; and deemed an excellent antifcorbutic. They are extremely fond of whifky, a fpirituous liquor diftilled from malt, which the pooreft can occafionally command, and which their inclination often leads them to ufe to great excefs."

Thefe people are extremely backward in the mechanic arts, though, where they have much intercourfe with other nations, this does not appear, and therefore does not proceed from natural inability; indeed we have already given an inftance of one peafant of Ruffia, who feems to poffefs very fuperior talents. See NEVA.

The drefs of thefe people is well calculated for the climate in which they live: they are particularly careful of their extremities. On their legs they wear one or two pair of thick worfted ftockings; and they envelope their legs with wrappers of coarfe flannel, or cloth feveral feet in length, and over thefe they frequently draw a pair of boots, fo large as to receive their bulky contents with eafe. The lower fort of people are grofsly ignorant; of which we fhall give a very furprifing inftance in the words of Mr Coxe.—"In many families, the father marries his fon while a boy of feven, eight, or nine years old, to a girl of a more advanced age, in order, as it is faid, to procure an able-bodied woman for the domeftic fervice: he cohabits with this perfon, now become his daughter-in-law, and frequently has feveral children by her. In my progrefs through Ruffia, I obferved in fome cottages, as it were, two miftreffes of a family; one the peafant's real wife, who was old enough to be his mother; and the other, who was nominally the fon's wife, but in reality the father's concubine. Thefe inceftuous marriages, fanctified by inveterate cuftom, and permitted by the parifh-priefts, were formerly more common than they are at prefent; but as the nation becomes more refined, and the priefts fomewhat more enlightened; and as they have lately been difcountenanced by government, they are daily falling into difufe; and, it is to be hoped, will be no longer tolerated (A)."

The

(A) "The truth of this fact, which fell under my own obfervation, and which I authenticated by repeated inquiries from all ranks of people, is ftill further confirmed by the following paffage in the Antidote to the Journey into Siberia, although the author gives another reafon for thofe early marriages. 'The peafants and common people not

Peasant.

The peasants of Russia, like those of Poland, are divided into those of the crown and those of individuals; the first of which are in the best condition; but all of them undergo great hardships, being subject to the despotic will of some cruel overseer. They may obtain freedom, 1. By manumission on the death of their master, or otherwise: 2. By purchase; and, lastly, By serving in the army or navy. The empress has redressed some of the grievances of this class of her subjects. The hardiness of the peasants arises in a great measure from their mode of education and way of life, and from the violent changes and great extremes of heat and cold to which they are exposed.

"The peasants of Finland differ widely from the Russians in their look and dress: they have for the most part fair complexions, and many of them red hair: they shave their beards, wear their hair parted at the top, and hanging to a considerable length over their shoulders (B). We could not avoid remarking, that they were in general more civilized than the Russians; and that even in the smallest villages we were able to procure much better accommodations than we usually met with in the largest towns which we had hitherto visited in this empire."

The peasants of Sweden (Mr Coxe informs us) are more honest than those in Russia; in better condition, and possessing more of the conveniencies of life, both with respect to food and furniture. "They are well clad in strong cloth of their own weaving. Their cottages, though built with wood, and only of one story, are comfortable and commodious. The room in which the family sleep is provided with ranges of beds in tiers (if I may so express myself), one above the other: upon the wooden testers of the beds in which the women lie, are placed others for the reception of the men, to which they ascend by means of ladders. To a person who has just quitted Germany, and been accustomed to tolerable inns, the Swedish cottages may perhaps appear miserable hovels; to me, who had been long used to places of far inferior accommodation, they seemed almost palaces. The traveller is able to procure many conveniences, and particularly a separate room from that inhabited by the family, which could seldom be obtained in the Polish and Russian villages. During my course through those two countries, a bed was a phenomenon which seldom occurred, excepting in the large towns, and even then not always completely equipped; but the poorest huts of Sweden were never deficient in this article of comfort: an evident proof that the Swedish peasants are more civilized than those of Poland and Russia.—After having witnessed the slavery of the peasants in those two countries, it was a pleasing satisfaction to find myself again among freemen, in a kingdom where there is a more equal division of property; where there is no vassalage; where the lowest order enjoy a security of their persons and property; and where the advantages resulting from this right are visible to the commonest observer."

Peasant, Peat.

The peasants of Holland and Switzerland are all in a very tolerable condition; not subject to the undisputed controul of a hireling master, they are freemen, and enjoy in their several stations the blessings of freedom. In Bohemia, Hungary, and a great part of Germany, they are legally slaves, and suffer all the miseries attending such a condition. In Spain, Savoy, and Italy, they are little better. In France, their situation was such as to warrant the first Revolution; but by carrying matters too far, they are now infinitely worse than they were at any former period.

PEAT, a well known inflammable substance, used in many parts of the world as fuel. There are two species:

1. A yellowish-brown or black peat, found in moorish grounds in Scotland, Holland, and Germany.—When fresh, it is of a viscid consistence, but hardens by exposure to the air. It consists, according to Kirwan, of clay mixed with calcareous earth and pyrites; sometimes also it contains common salt. While soft, it is formed into oblong pieces for fuel, after the pyritaceous and stony matters are separated. By distillation it yields water, acid, oil, and volatile alkali; the ashes containing a small proportion of fixed alkali; and being either white or red according to the proportion of pyrites contained in the substance.

The oil which is obtained from peat has a very pungent taste; and an empyreumatic smell, less fetid than that of animal substances, more so than that of mineral bitumens: it congeals in the cold into a pitchy mass, which liquefies in a small heat: it readily catches fire from a candle, but burns less vehemently than other oils, and immediately goes out upon removing the external flame: it dissolves almost totally in rectified spirit of wine into a dark brownish red liquor.

2. The second species is found near Newbury in Berkshire. In the Philosophical Transactions for the year 1757, we have an account of this species; the substance of which is as follows:

Peat is a composition of the branches, twigs, leaves, and roots of trees, with grass, straw, plants, and weeds, which having lain long in water, is formed into a mass so soft as to be cut through with a sharp spade. The colour is a blackish brown, and it is used in many places for firing. There is a stratum of this peat on each side the Kennet, near Newbury in Berks, which is from about a quarter to half a mile wide, and many miles long. The depth below the surface of the ground is from one foot to eight. Great numbers of entire trees are

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not only marry their sons at 14 and 15 years of age, but even at eight or nine, and that for the sake of having a workwoman the more in the person of the son's wife: By the same rule, they try to keep their daughters single as long as possible, because they don't choose to lose a workwoman. These premature marriages are of little use to the state; for which reason, methods to get the better of this custom have been sought for, and I hope will soon take place: the bishops are attentive to prevent these marriages as much as possible, and have of late succeeded greatly in their endeavours. It is only the inhabitants of some of the provinces in Russia that still retain this bad custom."

(B) The Russians have generally dark complexions and hair: they also wear their beards, and cut their hair short.

are found lying irregularly in the true peat. They are chiefly oaks, alders, willows, and firs, and appear to have been torn up by the roots; many horses heads, and bones of several kinds of deer, the horns of the antelope, the heads and tusks of boars, and the heads of beavers, are also found in it. Not many years ago an urn of a light brown colour, large enough to hold about a gallon, was found in the peat-pit in Speen moor, near Newbury, at about 10 feet from the river, and four feet below the level of the neighbouring ground. Just over the spot where the urn was found, an artificial hill was raised about eight feet high; and as this hill consisted both of peat and earth, it is evident that the peat was older than the urn. From the side of the river several semicircular ridges are drawn round the hill, with trenches between them. The urn was broken to shivers by the peat-diggers who found it, so that it could not be critically examined; nor can it be known whether any thing was contained in it.

For the mode of converting moss or peat into a valuable manure, see AGRICULTURE *Index*.

PEAUCIER, in *Anatomy*, a name given by Winslow, in his Treatise on the Head, and by some of the French writers, to the muscle called by Albinus *latissimus colli*; and by others *detrahens quadratus*, and *quadratus genæ*. Santorini has called the part of this which arises from the cheek *musculus risorius novus*; and some call the whole *platysma myoides*.

PEBBLES, a trivial name frequently given to different varieties of the agate. See AGATE, MINERALOGY *Index*.

PECARY, in *Zoology*. See MAMMALIA *Index*.

PECCANT, in *Medicine*, an epithet given to the humours of the body, when they offend either in quantity or quality, i. e. when they are either morbid, or in too great abundance. Most diseases arise from peccant humours, which are either to be corrected by alteratives and specifics, or else to be evacuated.

PECHEM, in the *Materia Medica*, a name given by the modern Greek writers to the root called *behem* by Avicenna and Serapion. Many have been at a loss to know what this root pechem was; but the virtues ascribed to it are the same with those of the behem of the Arabians; its description is the same, and the division of it into white and red is also the same as that of the behem. Nay, the word *pechem* is only formed of *behem* by changing the *b* into a *p*, which is very common, and the aspirate into χ, or *ch*, which is as common. Myrepsus, who treats of this root, says the same thing that the Arabian Avicenna says of behem, namely, that it was the fragments of a woody root, much corrugated and wrinkled on the surface, which was owing to its being so moist whilst fresh, that it always shrunk greatly in the drying.

PECHYAGRA, a name given by some authors to the gout affecting the elbow.

PECHYS, a name used by some anatomical writers for the elbow.

PECHYTYRBE, an epithet used by some medical writers for the scurvy.

PECK, a measure of capacity, four of which make a bushel.

PECK, *Francis*, a learned antiquarian, was born at Stamford in Lincolnshire, May 4. 1692, and educated at Cambridge, where he took the degrees of B. and M. A. He was the author of many works, of which the first is a poem, entitled, "Sighs on the Death of Queen Anne;" printed probably about the time of her death in 1714. Two years afterwards he printed "ΤΟ ΥΨΟΣ ΆΓΙΟΝ; or an Exercise on the Creation, and an Hymn to the Creator of the World; written in the express words of the sacred Text, as an Attempt to show the Beauty and Sublimity of the Holy Scriptures, 1716, 8vo." In 1721, being then curate of King's Clifton in Northamptonshire, he issued proposals for printing the History and Antiquities of his native town, which was published in 1727, in folio, under the title of "*Academia tertia Anglicana*; or the Antiquarian Annals of Stamford in Lincoln, Rutland, and Northamptonshires; containing the History of the University, Monasteries, Gilds, Churches, Chapels, Hospitals, and Schools there, &c." inscribed to John duke of Rutland. This work was hastened by "An Essay on the ancient and present State of Stamford, 1726, 4to," written by Francis Hargrave, who, in his preface, mentions the difference which had arisen between him and Mr Peck, on account of the former's publication unfairly forestalling that intended by the latter. Mr Peck is also therein very roughly treated, on account of a small work he had formerly printed, entitled, "The History of the Stamford Bull-running." Mr Peck had before this time obtained the rectory of Godeby near Melton in Leicestershire, the only preferment he ever enjoyed. In 1729, he printed on a single sheet, "Queries concerning the Natural History and Antiquities of Leicestershire and Rutland," which were afterwards reprinted in 1740; but although the progress he had made in the work was very considerable, yet it never made its appearance. In 1732 he published the first volume of "*Desiderata Curiosa*; or, a Collection of divers scarce and curious Pieces relating chiefly to Matters of English History; consisting of choice tracts, memoirs, letters, wills, epitaphs, &c. transcribed, many of them, from the originals themselves, and the rest from divers ancient MS. copies, or the MS. collations of sundry famous antiquaries and other eminent persons, both of the last and present age: the whole, as nearly as possible, digested into order of time, and illustrated with ample notes, contents, additional discourses, and a complete index." This volume was dedicated to Lord William Manners, and was followed, in 1735, by a second volume, dedicated to Dr Reynolds bishop of Lincoln. In 1735 Mr Peck printed in a 4to pamphlet, "A complete catalogue of all the discourses written both for and against popery in the time of King James II. containing in the whole an account of 457 books and pamphlets, a great number of them not mentioned in the three former catalogues; with references after each title, for the more speedy finding a further account of the said discourses and their authors in sundry writers, and an alphabetical list of the writers on each side." In 1739 he was the editor of "Nineteen Letters of the truly reverend and learned Henry Hammond, D. D. (author of the Annotations on the New Testament, &c.) written to Mr Peter Stainnough and Dr Nathaniel Angelo, many of them on curious subjects, &c." These were printed from the originals, communicated by Mr Robert Marsden archdeacon of Nottingham, and Mr John Worthington. The next year, 1740, produced two volumes in 4to, one of them entitled, "Memoirs of the Life and Ac-

tions of Oliver Cromwell, as delivered in three panegyrics of him written in Latin; the first, as said, by Don Juan Roderiguez de Saa Menefes, Conde de Penguiao, the Portugal ambaffador; the fecond, as affirmed by a certain Jefuit, the lord ambaffador's chaplain; yet both, it is thought, compofed by Mr John Milton (Latin fecretary to Cromwell), as was the third; with an Englifh verfion of each. The whole illuftrated with a large hiftorical preface; many fimilar paffages from the Paradife Loft, and other works of Mr John Milton, and notes from the beft hiftorians. To all which is added, a collection of divers curious hiftorical pieces relating to Cromwell, and a great number of other remarkable perfons (after the manner of *Defiderata Curiofa*, v. i. and ii.)" The other, "New Memoirs of the Life and poetical Works of Mr John Milton; with, firft, an examination of Milton's ftyle; and fecondly, explanatory and critical notes on divers paffages in Milton and Shakefpeare, by the editor. Thirdly, Baptiftes; a facred dramatic poem in defence of liberty, as written in Latin by Mr George Buchanan, tranflated into Englifh by Mr John Milton, and firft publifhed in 1641, by order of the houfe of commons. Fourthly, the Parallel, or Archbifhop Laud and Cardinal Wolfey compared, a Vifion by Milton. Fifthly, the Legend of Sir Nicholas Throckmorton, knt. chief butler of England, who died of poifon, *anno* 1570, an hiftorical poem by his nephew Sir Thomas Throckmorton, knt. Sixth, Herod the Great, by the editor. Seventh, the Refurrection, a poem in imitation of Milton, by a friend. And eighth, a Difcourfe on the Harmony of the Spheres, by Milton; with prefaces and notes." Thefe were the laft publications which he gave the world. When thefe appeared, he had in contemplation no lefs than nine different works; but whether he had not met with encouragement for thofe which he had already produced, or whether he was rendered incapable of executing them by reafon of his declining health, is uncertain; but none of them ever were made public. He concluded a laborious, and, it may be affirmed, an ufeful life, wholly devoted to antiquarian purfuits, Aug. 13. 1743, at the age of 61 years.

PECORA, in *Zoology*, the fifth order of the clafs mammalia, in the Linnean fyftem. See ZOOLOGY.

PECQUET, JOHN, was a phyfician in Dieppe, and died at Paris in 1674. He was phyfician in ordinary to the celebrated Fouquet, whom he entertained at his fpare hours with fome of the moft amufing experiments in natural philofophy. He acquired immortal honour to himfelf by the difcovery of a lacteal vein, which conveys the chyle to the heart; and which from his name is called *le Refervoir de Pecquet*. This difcovery was a frefh proof of the truth of the circulation of the blood: though it met with oppofition from many of the learned, particularly from the famous Riolau, who wrote a treatife againft the author of it, with this title: *Adverfus Pecquetum et Pecquetianos*. The only works which we have of Pecquet, are, 1. *Experimenta nova Anatomica*, publifhed at Paris, 1654. 2. A Differtation, *De Thoracis Lacteis*, publifhed at Amfterdam, 1661. He was a man of a lively and active genius; but his fprightlinefs fometimes led him to adopt dangerous opinions. He recommended, as a remedy for all difeafes, the ufe of brandy. This remedy, however, proved fatal to himfelf, and contributed to fhorten his days, which he might have employed to the advantage of the public.

PECTEN, the SCALLOP; a fpecies of fhell-fifh. See OSTREA, CONCHOLOGY *Index*.

PECTORAL, a facerdotal habit or veftment, worn by the Jewifh high-prieft. The Jews called it *Hhofchen*, the Greeks λογιον, the Latins *rationale* and *pectorale*, and in our verfion of the Bible it is called *breaftplate*. It confifted of embroidered ftuff, about a fpan fquare, and was worn upon the breaft, fet with twelve precious ftones, ranged in four rows, and containing the names of the twelve tribes. It was faftened to the fhoulder by two chains and hooks of gold. God himfelf prefcribed the form of it. See BREASTPLATE.

PECTORAL, a breaftplate of thin brafs, about 12 fingers fquare, worn by the poorer foldiers in the Roman army, who were rated under 1000 drachmæ. See LORICA.

PECTORAL, an epithet for medicines good in difeafes of the breaft and lungs.

PECTORALIS. See ANATOMY, *Table of the Mufcles*.

PECULATE, in *Civil Law*, the crime of embezzling the public money, by a perfon intrufted with the receipt, management, or cuftody thereof. This term is alfo ufed by civilians for a theft, whether the thing be public, fifcal, facred, or religious.

PECULIAR, in the *Canon Law*, fignifies a particular parifh or church that has jurifdiction within itfelf for granting probates of wills and adminiftrations, exempt from the ordinary or bifhop's courts. The king's chapel is a royal peculiar, exempt from all fpiritual jurifdiction, and referved to the vifitation and immediate government of the king himfelf. There is likewife the archbifhop's peculiar; for it is an ancient privilege of the fee of Canterbury, that wherever any manors or advowfons belong to it, they forthwith become exempt from the ordinary, and are reputed peculiars: there are 57 fuch peculiars in the fee of Canterbury.

Befides thefe, there are fome peculiars belonging to deans, chapters, and prebendaries, which are only exempted from the jurifdiction of the archdeacon: thefe are derived from the bifhop, who may vifit them, and to whom there lies an appeal.

Court of PECULIARS, is a branch of, and annexed to, the court of ARCHES. It has a jurifdiction over all thofe parifhes difperfed through the province of Canterbury in the midft of other diocefes, which are exempt from the ordinary's jurifdiction, and fubject to the metropolitan only. All ecclefiaftical caufes, arifing within thefe peculiar or exempt jurifdictions, are originally cognizable by this court: from which an appeal lay formerly to the pope, but now by the ftat. 25 Henry VIII. c. 19. to the king in chancery.

PECULIUM, the ftock or eftate which a perfon, in the power of another, whether male or female, either as his or her flave, may acquire by his induftry. Roman flaves frequently amaffed confiderable fums in his way. The word properly fignifies the advanced price which a flave could get for his mafter's cattle, &c. above the price fixed upon them by his mafter, which was the flave's own property.

In the Romifh church, peculium denotes the goods which each religious referves and poffeffes to himfelf.

PEDALS, the largeſt pipes of an organ, ſo called becauſe played and ſtopped with the foot. The pedals are made ſquare, and of wood; they are uſually 13 in number. They are of modern invention, and ſerve to carry the ſounds of an octave deeper than the reſt. See ORGAN.

PEDAGOGUE, or PÆDAGOGUE, a tutor or maſter, to whom is committed the diſcipline and direction of a ſcholar, to be inſtructed in grammar and other arts. The word is formed from the Greek παιδων αγωγος, *puerorum ductor*, "leader of boys."

M. Fleury obſerves, that the Greeks gave the name *pædagogus* to ſlaves appointed to attend their children, lead them, and teach them to walk, &c. The Romans gave the ſame denomination to the ſlaves who were intruſted with the care and inſtruction of their children.

PEDANT, a ſchoolmaſter or pedagogue, who profeſſes to inſtruct and govern youth, teach them the humanities, and the arts. See PEDAGOGUE.

PEDANT is alſo uſed for a rough, unpoliſhed man of letters, who makes an impertinent uſe of the ſciences, and abounds in unſeaſonable criticiſms and obſervations.

Dacier defines a pedant, a perſon who has more reading than good ſenſe. See PEDANTRY.

Pedants are people ever armed with quibbles and ſyllogiſms, breathe nothing but diſputation and chicanery, and purſue a propoſition to the laſt limits of logic.

Malebranche deſcribes a pedant as a man full of falſe erudition, who makes a parade of his knowledge, and is ever quoting ſome Greek or Latin author, or hunting back to a remote etymology.

St Evremont ſays, that to paint the folly of a pedant, we muſt repreſent him as turning all converſation to ſome one ſcience or ſubject he is beſt acquainted withal.

There are pedants of all conditions, and all robes. Wicquefort ſays, an ambaſſador, always attentive to formalities and decorums, is nothing elſe but a political pedant.

PEDANTRY, or PEDANTISM, the quality or manner of a pedant. See PEDANT.

To ſwell up little and low things, to make a vain ſhow of ſcience, to heap up Greek and Latin, without judgment, to tear thoſe to pieces who differ from us about a paſſage in Suetonius or other ancient authors, or in the etymology of a word, to ſtir up all the world againſt a man for not admiring Cicero enough, to be intereſted for the reputation of an ancient as if he were our next of kin, is what we properly call *pedantry*.

PEDARIAN, in Roman antiquity, thoſe ſenators who ſignified their votes by their feet, not with their tongues; that is, ſuch as walked over to the ſide of thoſe whoſe opinion they approved of, in diviſions of the ſenate.

Dr Middleton thus accounts for the origin of the word. He ſays, that though the magiſtrates of Rome had a right to a place and vote in the ſenate both during their office and after it, and before they were put upon the roll by the cenſors, yet they had not probably a right to ſpeak or debate there on any queſtion, at leaſt in the earlier ages of the republic. For this ſeems to have been the original diſtinction between them and the ancient ſenators, as it is plainly intimated in the formule of the conſular edict, ſent abroad to ſummon the ſenate, which was addreſſed to all ſenators, and to all thoſe who had a right to vote in the ſenate. From this diſtinction, thoſe who had only a right to vote were called in ridicule *pedarian*; becauſe they ſignified their votes by their feet, not their tongues, and upon every diviſion of the ſenate, went over to the ſide of thoſe whoſe opinion they approved. It was in alluſion to this old cuſtom, which ſeems to have been wholly dropt in the latter ages of the republic, that the mute part of the ſenate continued ſtill to be called by the name of *pedarians*, as Cicero informs us, who in giving an account to Atticus of a certain debate and decree of the ſenate upon it, ſays that it was made with the eager and general concurrence of the pedarians, though againſt the authority of all the conſulars.

PEDATURA, a term uſed in Roman antiquity, for a ſpace or proportion of a certain number of feet ſet out. This word often occurs in writers on military affairs: as in Hyginus de Caſtrametatione, we meet with *meminerimus itaque ad computatione cohortis equitatæ milliariæ pedaturam ad mille trecentos ſexaginta dari debere;* which is thus explained: The pedatura, or ſpace allowed for a *cohors equitata* or provincial cohort, conſiſting of both horſe and foot, could not be the ſame as the pedatura of an uniform body of infantry, of the ſame number, but muſt exceed it by 360 feet; for the proportion of the room of one horſeman to one foot ſoldier, he aſſigns as two and a half to one.

PEDERASTS, the ſame with SODOMITES.

PEDESTAL, in *Architecture*, the loweſt part of an order of columns, being that part which ſuſtains the column, and ſerves it as a foot to ſtand. See COLUMN.

PEDIÆAN, in Grecian antiquity. The city of Athens was anciently divided into three different parts; one on the deſcent of a hill; another on the ſea-ſhore; and a third in a plain between the other two. The inhabitants of the middle region were called Πεδιαιοι, *Pedieans*, formed from πεδιον, "plain," or "flat;" or as Ariſtotle will have it, *Pediacæ*: thoſe of the hill, Diacrians; and thoſe of the ſhore, Paralians.

Theſe quarters uſually compoſed ſo many different factions. Piſiſtratus made uſe of the Pediæans againſt the Diacrians. In the time of Solon, when a form of government was to be choſen, the Diacrians choſe it democratic; the Pediæans demanded an ariſtocracy; and the Paralians a mixed government.

PEDICLE, among botaniſts, that part of a ſtalk which immediately ſuſtains the leaf of a flower or a fruit, and is commonly called a *footſtalk*.

PEDICULUS, the LOUSE, a genus of inſects belonging to the order of aptera. See ENTOMOLOGY *Index*.

PEDILUVIUM, or *BATHING of the FEET*. The uſes of warm bathing in general, and of the pediluvium in particular, are ſo little underſtood, that they are often prepoſterouſly uſed, and ſometimes as injudiciouſly abſtained from.

In the Edinburgh Medical Eſſays, we find an ingenious author's opinion of the warm pediluvium, notwithſtanding that of Borelli, Boerhaave, and Hoffman, to the contrary, to be, That the legs becoming warmer than before, the blood in them is warmed: this blood rarefying, diſtends the veſſels; and in circulating imparts a great degree of warmth to the reſt of the maſs; and as there is a portion of it conſtantly paſſing through the legs, and acquiring new heat there, which heat is in the

Pediluvium ‖ Pedlar.

the courſe of circulation communicated to the reſt of the blood, the whole maſs rarefying, occupies a larger ſpace, and of conſequence circulates with greater force. The volume of the blood being thus increaſed, every veſſel is diſtended, and every part of the body feels the effects of it; the diſtant parts a little later than thoſe firſt heated. The benefit obtained by a warm pediluvium is generally attributed to its making a derivation into the parts immerſed, and a revulſion from thoſe affected, becauſe they are relieved; but the cure is performed by the direct contrary method of operating, viz. by a greater force of circulation through the parts affected, removing what was ſtagnant or moving too ſluggiſhly there. Warm bathing is of no ſervice where there is an irreſoluble obſtruction, though, by its taking off from a ſpaſm in general, it may ſeem to give a moment's eaſe; nor does it draw from the diſtant parts, but often hurts by puſhing againſt matter that will not yield with a ſtronger impetus of circulation than the ſtretched and diſeaſed veſſels can bear: ſo that where there is any ſuſpicion of ſcirrhus, warm bathing of any ſort ſhould never be uſed. On the other hand, where obſtructions are not of long ſtanding, and the impacted matter is not obſtinate, warm baths may be of great uſe to reſolve them quickly. In recent colds, with ſlight humoral peripneumonies, they are frequently an immediate cure. This they effect by increaſing the force of the circulation, opening the ſkin, and driving freely through the lungs that lentor which ſtagnated or moved ſlowly in them. As thus conducing to the reſolution of obſtructions, they may be conſidered as ſhort and ſafe fevers; and in uſing them we imitate nature, which by a fever often carries off an obſtructing cauſe of a chronical aliment. Borelli, Boerhaave, and Hoffman, are all of opinion, that the warm pediluvium acts by driving a larger quantity of blood into the parts immerſed. But arguments muſt give way to facts: the experiments related in the Medical Eſſays ſeem to prove to a demonſtration, that the warm pediluvium acts by rarefying the blood.

A warm pediluvium, when rightly tempered, may be uſed as a ſafe cordial, by which circulation can be rouſed, or a gentle fever raiſed; with this advantage over the cordials and ſudorifics, that the effect of them may be taken off at pleaſure.

Pediluvia are ſometimes uſed in the ſmallpox; but Dr Stevenſon thinks their frequent tumultuous operations render that ſuſpected, and at beſt of very doubtful effect; and he therefore prefers Monſ. Martin of Lauſanne's method of bathing the ſkin, not only of the legs, but of the whole body, with a ſoft cloth dipped in warm water, every four hours, till the eruption; by which means the puſtules may become univerſally higher, and conſequently more ſafe.

PEDIMENT. See Architecture.

PEDLAR, a travelling foot-trader. See Hawkers.

In Britain (and formerly in France) the pedlars are deſpiſed; but it is otherwiſe in certain countries. In Spaniſh America, the buſineſs is ſo profitable, that it is thought by no means diſhonourable; and there are many gentlemen in Old Spain, who, when their circumſtances are declining, ſend their ſons to the Indies to retrieve their fortunes in this way. Almoſt all the commodities of Europe are diſtributed through the ſouthern continent of America by means of theſe pedlars. They come from Panama to Paita by ſea; and in the road from the port laſt mentioned, they make Peura their firſt voyage to Lima. Some take the road through Caxamalca: others through Truxillo, along ſhore from Lima. They take their paſſage back to Panama by ſea, and perhaps take with them a little cargo of brandy. At Panama they again ſtock themſelves with European goods, returning by ſea to Paita, where they are put on ſhore; there they hire mules and load them, the Indians going with them in order to lead them back. Their travelling expences are next to nothing; for the Indians are brought under ſuch ſubjection, that they find lodging for them, and provender for their mules, frequently thinking it an honour done them for their gueſts to accept of this for nothing, unleſs the ſtranger now and then, out of generoſity or compaſſion, makes a ſmall recompenſe.

Pedlar ‖ Pedro.

In Poland, where there are few or no manufactures, almoſt all the merchandiſe is carried on by pedlars, who are ſaid to be generally Scotſmen, and who, in the reign of King Charles II. are ſaid to have amounted to no fewer than 53,000

PEDOMETER, or Podometer, formed from πους, *pes*, "foot," and μετρον, "meaſure," way-wiſer; a mechanical inſtrument, in form of a watch, conſiſting of various wheels with teeth, catching in one another, all diſpoſed in the ſame plane; which, by means of a chain or ſtring faſtened to a man's foot, or to the wheel of a chariot, advance a notch each ſtep, or each revolution of the wheel; ſo that the number being marked on the edge of each wheel, one may number the paces, or meaſure exactly the diſtance from one place to another. There are ſome of them which mark the time on a dial-plate, and are in every reſpect much like a watch, and are accordingly worn in the pocket like a watch. See Perambulator.

PEDRO, Don, of Portugal, duke of Coimbra, was the fourth child and ſecond ſurviving ſon of King John of Portugal, and was born March the 4th 1394. His father gave him an excellent education, which, joined to ſtrong natural abilities and much application, rendered him one of the moſt accompliſhed princes of his time. He was not only very learned himſelf, but a great lover of learning, and a great patron of learned men. It was chiefly with a view to improve his knowledge that he ſpent four years in travelling through different countries in Europe, Aſia, and Africa, with a train ſuitable to his quality; of which travels there is a relation ſtill extant, but ſo loaded with fabulous circumſtances, that it wounds the reputation it was deſigned to raiſe. At his return he eſpouſed Iſabella, daughter to the count of Urgel, and grand-daughter to Don Pedro, the fourth king of Portugal, which was eſteemed a very great advancement of his fortune. He was elected into the moſt noble order of the Garter, April 22. 1417, in the fifth year of the reign of his couſin Henry V. grandſon of John of Gaunt, by the father's ſide, as our duke of Coimbra was by the mother. In 1440 he was declared regent during the minority of his couſin Don Alonſo V. ſon of King Edward, who died by the plague. He found ſome difficulty at firſt in the diſcharge of his office, both from the queen-mother and others. But, upon the whole, his adminiſtration was ſo mild and ſo juſt, that the magiſtrates and people of Liſbon concurred in demanding his leave to erect a ſtatue to him. The regent

gent thanked them, said he should be unwilling to see a work of their's demolished; and that he was sufficiently rewarded by this public testimony of their affections. The queen dowager wished to raise disturbances in Portugal by aiming to recover the regency to herself; but the steadiness of the regent's administration, the attachment of the best part of the nobility to him, and his enjoying, in so absolute a degree, the confidence of the people, not only secured the interior tranquillity of the state, but raised the credit likewise of the crown of Portugal to a very great height in the sentiments of its neighbours: for, in the course of his regency, he had made it his continual study to pursue the public good; to ease the people in general, and the inhabitants of Lisbon in particular, of several impositions; to maintain the laws in their full vigour; to give the king an excellent education; and if that had been at all practicable, to diffuse a perfect unanimity through the court, by assuaging the malice and envy of his enemies. The king when he came of age, and the *cortes* or parliament, expressed their entire satisfaction with the regent's administration; and all parties entirely approved of the king's marriage with Donna Isabella, the regent's daughter, which was celebrated in 1446. The enmity of his enemies, however, was not in the least abated by the regent's being out of office. They still persecuted him with their unjust calumnies, and unfortunately made the king hearken to their falsehoods. The unfortunate duke, when ordered to appear before the king, was advised to take with him an escort of horse and foot. In his passage he was proclaimed a rebel, and quickly after he was surrounded by the king's troops. Soon after he was attacked, and in the heat of action he was killed: nor was the envy of his enemies even then satiated; his body was forbid burial; and was at length taken away privately by the peasants. His virtue, however hated in courts, was adored by the uncorrupt part of his countrymen. At length, though, by an inspection of his papers, the king saw, when it was too late, the injustice that had been done the man who had behaved so well in so high and difficult an office; and whose papers only discovered signs of further benefit to the king and his dominions. In consequence of these discoveries, the duke's adherents were declared loyal subjects, all prosecutions were ordered to cease, and the king desired the body of Coimbra to be transported with great pomp from the castle of Abrantes to the monastery of Batalha; where it was interred in the tomb which he had caused to be erected for himself. The royal name of Don Pedro occurs often in the history of Portugal, and many who bore the name were singularly distiftinguished either for great abilities, or external splendour. See PORTUGAL.

PEDUNCLE, in *Botany*. See PEDICLE.

PEEBLES, a royal borough and county town of Peebles-shire or Tweedale, is situated on the banks of the Tweed, 22 miles south from Edinburgh. Peebles was a royal residence in the time of James I. of Scotland; and here it is supposed, he composed the poem of "Peebles at the Play." Peebles has considerable woollen manufactures, and is noted for excellent beer. The population in 1801 amounted to 2000 inhabitants.

PEEBLES-SHIRE, or TWEEDALE, a county of Scotland, extending 36 miles in length and about 10 in breadth. It is bounded on the east by Ettrick Forest, on the south by Annandale, on the west by Clydesdale, and on the north by Mid-Lothian. Tweedale is a hilly country, well watered with the Tweed, the Yarrow, and a great number of smaller streams that fertilize the valleys, which produce good harvests of oats and barley, with some proportion of wheat. All the rivers of any consequence abound with trout and salmon. The lake called *West-Water Loch* swarms with a prodigious number of eels. In the month of August, when the west wind blows, they tumble into the river Yarrow in such shoals, that the people who wade in to catch them run the risk of being overturned. About the middle of this county is the hill or mountain of Braidalb, from the top of which the sea may be seen on each side of the island. Tweedale abounds with limestone and freestone. The hills are generally as green as the downs in Sussex, and feed innumerable flocks of sheep, that yield great quantities of excellent wool. The country is well shaded with woods and plantations, abounds with all the necessaries of life, and is adorned with many fine seats and several populous villages. The earls of March were hereditary sheriffs of Tweedale, which bestows the title of *marquis* on a branch of the ancient house of Hay, earls of Errol, and hereditary high constables of Scotland. The family of Tweedale is, by the female side, descended from the famous Simon de Fraser, proprietor of great part of this county, and who had a great share in obtaining the triple victory at Roslin. The chief town in Tweedale, is PEEBLES, a royal borough, and seat of a presbytery, pleasantly situated on the banks of the Tweed, over which there is at this place a stately stone bridge of five arches. In the neighbourhood of Peebles, near the village of Romana, on the river Lene, we see the vestiges of two Roman castella, or stationary forts; and a great many terraces on the neighbouring hills, which perhaps have served as itinerary encampments. In the shire of Tweedale there are many ancient and honourable families. Douglas of Cavers, who was hereditary sheriff of the county, it is said still preserves the standard and the iron mace of the gallant Lord Douglas, who fell in the battle of Otterburn, just as his troops had defeated and taken Henry Percy, surnamed *Hotspur*. In the churchyard of Drumelzier, belonging to an ancient branch of the Hay family, the famous Merlin is supposed to lie buried. There was an old traditional prophecy, that the two kingdoms should be united when the waters of the Tweed and the Pansel should meet at his grave. Accordingly, the country people observe that this meeting happened in consequence of an inundation at the accession of James VI. to the crown of England.

The population of this county, in 1801, amounted to 8717. But the following is the population at two different periods, according to its parishes.

	Parishes.	Population in 1755.	Population in 1790—1798.
1	Broughton	367	264
	Drumelzier	305	270
	Eddlestown	679	710
	Glenholm	392	300
5	Inverleithen	559	560
	Kilbucho	279	362
	Kirkurd	310	288
	Linton	831	928

Peebles-shire ‖ Peers.

	Parishes.	Population in 1755.	Population in 1790—1798.
	Lyne	265	160
10	Mannor	320	229
	Newlands	1009	891
	Peebles	1896	1920
	Skirling	335	234
	Stobo	313	318
15	Traquair	651	446
16	Tweedſmuir	397	227
		8908	8107
		8107	
	Decreaſe,	801 *	

* *Statiſt. Hiſt.* vol. xx.

PEEK, in the ſea-language, is a word uſed in various ſenſes. Thus the anchor is ſaid to be a-peek, when the ſhip being about to weigh comes over her anchor in ſuch a manner that the cable hangs perpendicularly between the hauſe and the anchor.

To heave a-peek, is to bring the peek ſo as that the anchor may hang a-peek. A ſhip is ſaid to ride a-peek, when lying with her main and foreyards hoiſted up, one end of her yards is brought down to the ſhrouds, and the other raiſed up on end; which is chiefly done when ſhe lies in rivers, leſt other ſhips falling foul of the yards ſhould break them. Riding a-broad peek, denotes much the ſame, excepting that the yards are only raiſed to half the height.

Peek is alſo uſed for a room in the hold, extending from the bitts forward to the ſtern: in this room men of war keep their powder, and merchantmen their victuals.

PEEL, a town in the iſle of Man, formerly called Holm-town, has a fort in a ſmall iſland, and a garriſon well ſupplied with cannon. In it are the ancient cathedral, the lord's houſe, with ſome lodgings of the biſhops, and other remains of antiquity.

PEER, in general, ſignifies an equal, or one of the ſame rank and ſtation: hence in the acts of ſome councils, we find theſe words, *with the conſent of our peers, biſhops, abbots*, &c. Afterwards the ſame term was applied to the vaſſals or tenants of the ſame lord, who were called *peers*, becauſe they were all equal in condition, and obliged to ſerve and attend him in his courts; and peers *in fiefs*, becauſe they all held fiefs of the ſame lord.

The term *peers* is now applied to thoſe who are impannelled in an inqueſt upon a perſon for convicting or acquitting him of any offence laid to his charge: and the reaſon why the jury is ſo called, is becauſe, by the common law and the cuſtom of this kingdom, every perſon is to be tried by his peers or equals; a lord by the lords, and a commoner by commoners. See the article JURY.

PEER of the Realm, a noble lord who has a ſeat and vote in the houſe of lords, which is alſo called the *Houſe of Peers*.

Theſe lords are called *peers*, becauſe though there is a diſtinction of degrees in our nobility, yet in public actions they are equal, as in their votes in parliament, and in trying any nobleman or other perſon impeached by the commons, &c. See PARLIAMENT.

Peers, Peereſs.

Houſe of PEERS, or *Houſe of Lords*, forms one of the three eſtates of parliament. See LORDS and PARLIAMENT.

In a judicative capacity, the houſe of peers is the ſupreme court of the kingdom, having at preſent no original juriſdiction over cauſes, but only upon appeals and writs of error; to rectify any injuſtice or miſtake of the law committed by the courts below. To this authority they ſucceeded of courſe upon the diſſolution of the *Aula Regia*. For as the barons of parliament were conſtituent members of that court, and the reſt of its juriſdiction was dealt out to other tribunals, over which the great officers who accompanied thoſe barons were reſpectively delegated to preſide, it followed, that the right of receiving appeals, and ſuperintending all other juriſdictions, ſtill remained in that noble aſſembly, from which every other great court was derived. They are therefore in all caſes the laſt reſort, from whoſe judgment no farther appeal is permitted; but every ſubordinate tribunal muſt conform to their determinations: The law repoſing an entire confidence in the honour and conſcience of the noble perſons who compoſe this important aſſembly, that they will make themſelves maſters of thoſe queſtions upon which they undertake to decide; ſince upon their deciſion all property muſt finally depend. See LORDS, NOBILITY, &c.

PEERS, in the former government of France, were twelve great lords of that kingdom; of which ſix were dukes and ſix counts; and of theſe, ſix were eccleſiaſtics and ſix laymen: thus the archbiſhop of Rheims, and the biſhop of Laon and Langres, were dukes and peers; and the biſhops of Chalons on the Marn, Noyons, and Beauvais, were counts and peers. The dukes of Burgundy, Normandy, and Aquitain, were lay peers and dukes; and the counts of Flanders, Champagne, and Toulouſe, lay peers and counts. Theſe peers aſſiſted at the coronation of kings, either in perſon or by their repreſentatives, where each performed the functions attached to his reſpective dignity: but as the ſix lay peerages were all united to the crown, except that of the count of Flanders, ſix lords of the firſt quality were choſen to repreſent them: but the eccleſiaſtical peers generally aſſiſted in perſon. The title of peer was lately beſtowed on every lord whoſe eſtate was erected into a peerage; the number of which, as it depended entirely on the king, was uncertain.

PEERESS, a woman who is noble by deſcent, creation, or marriage. For, as we have noblemen of ſeveral ranks, ſo we may have noblewomen; thus King Henry VIII. made Anne Bullen marchioneſs of Pembroke; King James I. created the lady Compton, wife to Sir Thomas Compton, counteſs of Buckingham, in the lifetime of her huſband, without any addition of honour to him; and alſo the ſame king made the lady Finch, viſcounteſs of Maidſtone, and afterwards counteſs of Winchelſea, to her and the heirs of her body; and King George I. made the lady Schulenberg, ducheſs of Kendal.

If a peereſs, by deſcent or creation, marry a perſon under the degree of nobility, ſhe ſtill continues noble: but if ſhe obtain that dignity only by marriage, ſhe loſes it, on her afterwards marrying a commoner; yet by the courteſy of England, ſhe generally retains the title of her nobility.

A counteſs or baroneſs may not be arreſted for debt or treſpaſs; for though in reſpect of their ſex, they cannot ſit in parliament, they are nevertheleſs peers of the realm, and ſhall be tried by their peers, &c.

PEWIT, a ſpecies of gull. See LARUS, ORNITHOLOGY *Index*.

PEGASUS, among the poets, a horſe imagined to have wings; being that on which Bellerophon was fabled to be mounted when he engaged the Chimera. See CHIMERA.

The opening of the fountain Hippocrene on Mount Helicon is aſcribed to a blow of Pegaſus's hoof. It was feigned to have flown away to heaven, where it became a conſtellation. Hence

PEGASUS, in *Aſtronomy*, the name of a conſtellation of the northern hemiſphere, in form of a flying horſe. See ASTRONOMY.

PEGMARES, a name by which certain gladiators were diſtinguiſhed, who fought upon moveable ſcaffolds called *pegmata*, which were ſometimes unexpectedly raiſed, and by this means ſurpriſed the people with gladiators in hot contention. They were ſometimes ſo ſuddenly lifted up as to throw the combatants into the air; and ſometimes they were let down into dark and deep holes, and then ſet on fire, thus becoming the funeral-piles of thoſe miſerable wretches; and roaſting them alive to divert the populace.

PEGU, a very conſiderable kingdom of Aſia, beyond the Ganges. The country properly ſo called is but about 350 miles in length from north to ſouth, and as much in breadth from eaſt to weſt. It is ſituated on the eaſtern ſide of the bay of Bengal, nearly oppoſite to Arixa, and to the north-eaſt of the coaſt of Coromandel. It is bounded on the north by the kingdoms of Arrakan and Ava; on the eaſt by the Upper and Lower Siam, on the ſouth by part of Siam and the ſea; and on the weſt by the ſea and part of Arrakan.

The kingdom of Pegu is ſaid to have been founded about 1100 years ago. Its firſt king was a ſeaman; concerning whom and his ſucceſſors we know nothing till the diſcovery of the Eaſt Indies by the Portugueſe in the beginning of the 16th century. In 1518 the throne of Pegu was poſſeſſed by one Breſſagukan, with whom Antony Correa the Portugueſe ambaſſador ſolemnly concluded a peace in 1519. This monarch was poſſeſſed of a very large and rich empire, nine kingdoms being in ſubjection to him, whoſe revenues amounted to three millions of gold. We hear no farther accounts of his tranſactions after the concluſion of the treaty with the Portugueſe. In 1539 he was murdered on the following occaſion: Among other princes who were his tributaries was Para Mandara, king of the Birmans or Barmans. Theſe people inhabited the high lands called *Pangavirau*, to the northward of the kingdom of Pegu. Their prince, by one of the terms of his vaſſalage, was obliged to furniſh the king of Pegu with 30,000 Birmans to labour in his mines and other public works. As the king uſed frequently to go and ſee how his works went forward, and in theſe journeys took along with him none but his women, the Birmans obſerving theſe viſits frequently repeated, formed a deſign of robbing the queen and all the concubines of their jewels; and purſuant to this deſign, the next time the king viſited the works, they murdered him, and having ſtripped the ladies, fled to their own country.

By this enormity all Pegu was thrown into confuſion: but, inſtead of revenging the death of their king, the people divided everywhere into factions; ſo that Dacha Rupi, the lawful heir to the crown, found himſelf unable to maintain his authority. Of theſe commotions, the king of the Birmans taking the advantage, not only ſhook off the yoke, but formed a deſign of conquering the kingdom of Pegu itſelf.—With this view he invaded the country with an army of more than a million of foot, and 5000 elephants; beſides a great fleet which he ſent down the river Ava towards Bagou or Pegu, the capital of the empire; while he himſelf marched thither by land. Juſt at this time Ferdinand de Mirales arrived at Pegu from Goa with a large galleon richly laden on account of the king of Portugal. As ſoon as Dacha Rupi heard of his coming, he ſent to deſire his aſſiſtance againſt the enemy. This he obtained by great preſents and promiſes: and Mirales, ſetting out in a galliot, joined the king's ſhips. Had the numbers been any thing near an equality, the ſuperior ſkill of Mirales would undoubtedly have gained the victory: But the fleet of the Birmans covered the whole river, though as large as the Ganges, while that of Dacha Rupi could ſcarcely be obſerved in compariſon with them. Mirales did every thing that man could do, and even held out alone after the natives had deſerted him; but at laſt, oppreſſed and overwhelmed with numbers, he was killed, with all his men.

Thus Para Mandara became maſter of all Pegu; after which he attacked the tributary kingdoms. In 1544 he beſieged Martavan, the capital of a kingdom of the ſame name, then very great and flouriſhing. The land forces which he brought againſt it conſiſted of 700,000 men, while by ſea he attacked it with a fleet of 1700 ſail; 100 of which were large galleys, and in them 700 Portugueſe commanded by John Cayero, who had the reputation of being a valiant and experienced officer. The ſiege, however, continued ſeven months, during which time the Birmans loſt 120,000 men; but at laſt the beſieged king, finding himſelf ſtraitened for want of proviſions, and unable to withſtand ſo great a power, offered terms of capitulation. The beſiegers would admit of no terms, upon which the diſtreſſed king applied to the Portugueſe in the ſervice of his enemy; for by their aſſiſtance he doubted not to be able to drive away the Birmans. Accordingly, he ſent one Seixas to Cayero, intreating him to receive himſelf, his family, and treaſure, on board the four ſhips he had under his command; offering, on that condition, to give half his riches to the king of Portugal, to become his vaſſal, and pay ſuch tribute as ſhould be agreed upon. Cayero conſulted the principal officers, and in their preſence aſked Seixas what he thought the treaſure might amount to. Seixas anſwered, that out of what he had ſeen, for he had not ſeen all, two ſhips might be loaded with gold, and four or five with ſilver. This propoſal was too advantageous to be ſlighted; but the reſt of the officers envying the great fortune which Cayero would make, threatened to diſcover the whole to the king of Barma or Birma if he did not reject it. The unhappy king of Martavan had now no other reſource but to ſet fire to the city, make a ſally, and die honourably with the few men he had with him: but even here he was diſappointed; for by the deſertion of 4000 of his troops the enemy were appriſed of his deſign, and prevented it. Thus

betrayed,

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betrayed, he capitulated with the Barma king for his own life and the lives of his wife and children, with leave to end his days in retirement. All this was readily granted, but the conqueror intended to perform no part of his promiſe. The city was plundered and burnt, by which above 60,000 perſons periſhed, while at leaſt an equal number were carried into ſlavery. Six thouſand cannon were found in the place; 100,000 quintals of pepper, and an equal quantity of other ſpices. The day after this deſtruction, 21 gibbets were erected on a hill adjoining to the city; on which the queen, her children, and ladies, were executed, by hanging them up alive by the feet: however, the queen expired with anguiſh before ſhe ſuffered ſuch a cruel indignity. The king, with 50 of his chief lords, was caſt into the ſea, with ſtones about their necks. This monſtrous cruelty ſo provoked the tyrant's ſoldiers, that they mutinied, and he was in no ſmall danger of ſuffering for it: however, he found means to pacify them; after which he proceeded to beſiege Prom, the capital of another kingdom. Here he increaſed his army to 900,000 men. The queen by whom it was governed offered to ſubmit to be his vaſſal; but nothing would ſatisfy the Barma monarch leſs than her ſurrender at diſcretion, and putting all her treaſure into his hands. This ſhe, who knew his perfidy, refuſed to do: on which the city was fiercely aſſaulted, but greatly to the diſadvantage of the Barmas, who loſt near 100,000 men. However, the city was at laſt betrayed to him, when Mandara behaved with his uſual cruelty. Two thouſand children were ſlain, and their bodies cut in pieces and thrown to the elephants; the queen was ſtripped naked, publicly whipped, and then tortured, till ſhe died; the young king was tied to her dead body, and both together caſt into a river, as were alſo 300 other people of quality.

While the tyrant was employed in fortifying the city, he was informed, that the prince of Ava had ſailed down the river Queytor with 400 rowing veſſels having 30,000 ſoldiers on board; but that, hearing of the queen's diſaſter, he ſtopped at Meletay, a ſtrong fortreſs about 12 leagues north of Prom, where he waited to be joined by his father the king of Ava with 80,000 men. On this news the Barma king ſent his foſter-brother Chaumigrem along the river ſide with 200,000 men, while he himſelf followed with 100,000 more. The prince, in this emergency, burnt his barks, forming a vanguard of the mariners, and, putting his ſmall army in the beſt poſition he could, expected the enemy. A moſt deſperate engagement enſued, in which 800 only of the prince's army were left, and 115,000 out of 200,000 Barmas who oppoſed him were killed. The 800 Avans retired into the fort: but Mandara coming up ſoon after, and being enraged at the terrible havock made in his army, attacked the fortreſs moſt violently for ſeven days; at the end of which time, the 800, finding themſelves unable to hold out any longer, ruſhed out in a dark and rainy night, in order to ſell their lives at as dear a rate as poſſible. This laſt effort was ſo extremely violent, that they broke through the enemy's troops in ſeveral places, and even preſſed ſo hard on the king himſelf that he was forced to jump into the river. However, they were at laſt all cut off, but not before they had deſtroyed 12,000 of their enemies.

Mandara having thus become maſter of the fort, commanded it to be immediately repaired; and ſailed up the river to the port of Ava, about a league from the capital, where he burnt between 2000 and 3000 veſſels, and loſt in the enterpriſe about 8000 men. The city itſelf he did not think proper to inveſt, as it had been newly fortified, was defended by a numerous garriſon, and an army of 80,000 men was advancing to its relief. The king alſo, apprehenſive of Mandara's power, had implored the protection of the emperor of Siam; offering to become his tributary on condition that he would aſſiſt him with his forces in recovering the city of Prom. To this the emperor readily aſſented; which news greatly alarmed the Barma monarch, ſo that he diſpatched ambaſſadors to the Kalaminham or ſovereign of a large territory adjacent, requeſting him to divert the emperor from his purpoſe. On the ambaſſadors return from this court, it appeared that the treaty had already taken effect; but as the ſeaſon was not yet arrived for invading Ava, Chaumigrem, the king's foſter-brother, was ſent with 150,000 men to reduce Sebadi or Savadi the capital of a ſmall kingdom about 130 leagues north-eaſt from Pegu. The general, however, failed in his attempt; and afterwards endeavouring to revenge himſelf on a town in the neighbourhood, he was ſurpriſed by the enemy and put to flight.

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In the meantime, the empire of Siam fell into great diſtractions; the king, together with the heir to the crown, were murdered by the queen, who had fallen in love with an officer, whom ſhe married after her huſband's death. However, both of them were ſoon after killed at an entertainment; and the crown was given to a natural brother of the late king, but a coward and a tyrant. On this Mandara reſolved to invade the country; and, his principal courtiers concurring in the ſcheme, he collected an army of 800,000 men, with no fewer than 20,000 elephants. In this army were 1000 Portugueſe, commanded by one James Suarez, who already had a penſion of 200,000 ducats a-year from the king of Pegu, with the title of his brother, and governor of the kingdom. With this formidable army he ſet out in April 1548. His firſt atchievement was the taking of a fortreſs on the borders of the enemy's country; before which, being ſeveral times repulſed, and having loſt 3000 of his men, he revenged himſelf by putting all the women to the ſword. He next beſieged the capital itſelf; but though the ſiege was continued for five months, during which time the moſt violent attacks were made upon it, the aſſailants were conſtantly repulſed with great loſs. However, it was ſtill reſolved to continue the ſiege; and a mount of earth was raiſed, on which were placed 40 pieces of cannon, ready to batter it anew, when, in October, advice was received of a rebellion having broke out in Pegu.

The perſon who headed the rebels on the preſent occaſion was Shoripam Shay, near akin to the former monarch ſlain 12 years before. He was a religious perſon, of great underſtanding, and eſteemed a ſaint. As he was a famous preacher, he made a ſermon, in which he ſet forth the tyranny of the Birmans in ſuch a manner, that he was immediately taken out of the pulpit, and proclaimed king by the people, who, as a token of ſovereignty, gave him the title of *Shemindoo*. The firſt act of ſovereignty which he exerted was to cut in pieces 15,000 Birmans, and ſeize on the treaſure; and ſo agreeable was this change of government to all ranks of people,

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people, that in three weeks time all the strong holds of Pegu fell into his hands.

On this news the king immediately raised the siege in which he was engaged, and in 17 days got to Martavan. Here he was informed, that Shemindoo had posted 500,000 men in different places, in order to intercept his passage; at the same time that he had the mortification to find 50,000 of his best troops deserted. To prevent a greater desertion, after 14 days stay, he departed from Martavan, and soon met Shemindoo at the head of 600,000 men. A desperate engagement followed; in which Shemindoo was entirely defeated, with the loss of 300,000 men. Of the Birman troops were slain 60,000; among whom were 280 Portuguese.

The morning after this victory, the tyrant marched to the city: the inhabitants of which surrendered, on condition of having their lives and effects spared. The kingdom being thus again brought under his subjection, his next step was to punish the principal persons concerned in the rebellion: their heads he cut off, and confiscated their estates, which amounted to no less than ten millions of gold. Others say, that he put all without distinction to the sword, excepting only 12,000, who took shelter in James Suarez's house; that alone affording an asylum from the general slaughter. The plunder was incredible, Suarez alone getting three millions. All these cruelties, however, were insufficient to secure the allegiance of the tyrant's subjects: for in less than three months news was brought that the city of Martavan had revolted; and that the governor had not only declared for Shemindoo, but murdered 2000 Birmans. Mandara then summoned all the lords of the kingdom to meet him with their force, within 15 days, at a place called *Mouchau*, not far from his capital, whither he himself went with 300 men, to wait their arrival. But in the meantime he received intelligence that the shemin or governor of Zatan, a city of some consequence, had submitted to Shemindoo, and also lent him a large sum of gold. The shemin was immediately sent for in order to be put to death: but he, suspecting Mandara's design, excused himself by pretending sickness; after which, having consulted with his friends, he drew together about 600 men; and having with these privately advanced to the place where the king was, he killed him, with the few attendants that were about him at the time. The guards in the court being alarmed with the noise, a skirmish ensued with the shemin's men, in which about 800 were slain on both sides, most of them Birmans. The shemin then retreated to a place called *Pontel*; whither the people of the country, hearing of the death of the king, who was universally hated, resorted to him. When he had assembled about 5000 men, he returned to seek the troops which the late king had with him; and finding them dispersed in several places, easily killed them all. With the Birmans were slain 80 out of 300 Portuguese. The remainder surrendered, with Suarez their leader; and were spared, on condition of their remaining in the service of the shemin.

The shemin, now finding his forces daily increase, assumed the title of *king*; and, to render himself the more popular, gave out that he would exterminate the Birmans so effectually, as not to leave one in all the kingdom. It happened, however, that one of those who were with the late king at the time he was murdered, escaped the general slaughter; and, swimming over the river, informed Chaumigrem of the king's death. He had with him 180,000 men, all of them natives of Pegu, excepting 30,000 Barmas. He knew very well, that if the natives had known that the king was dead, he and all his Barmas would have instantly been put to the sword. Pretending, therefore, that he had received orders to put garrisons into several places, Chaumigrem dispatched all the natives into different parts; and thus got rid of those whom he had so much cause to fear. As soon as they were marched, he turned back upon the capital, and seized the king's treasure, together with all the arms and ammunition. He then set fire to the magazines, arsenals, palace, some of whose apartments were ceiled with gold, and 2000 rowing vessels which were on the river. Then destroying all the artillery, he fled with the 30,000 Barmas to his own country, being pursued in vain by the natives of Pegu.

Pegu.

Thus the shemin of Zatan was left in quiet possession of the kingdom; but, by his repeated acts of tyranny and cruelty, he so disgusted his subjects, that many fled to foreign countries, while others went over to Shemindoo, who began now to gather strength again. In the mean time, James Suarez, the Portuguese whom we have often mentioned, lost his life by attempting to ravish a young woman of distinction; the shemin being unable to protect him, and obliged to give him up to the mob, who stoned him to death. The shemin himself did not long survive him; for, being grown intolerable by his oppressions, most of his followers abandoned him, and he was besieged in his capital by Shemindoo with an army of 200,000 men, and soon after slain in a sally; so that Shemindoo now seemed to be fully established on the throne. But in the mean time Chaumigrem, the foster-brother to the deceased king, hearing that Pegu was very ill provided with the means of defence, invaded the kingdom with an army of 300,000 men. Shemindoo met him with three times their number; but his men, being all natives of Pegu, were inferior in strength, notwithstanding their numbers, to the enemy. The consequence was, that Shemindoo was defeated with prodigious slaughter, and Chaumigrem caused himself to be proclaimed king of Pegu. Shortly after, Shemindoo himself was taken; and, after being treated with the utmost cruelty, was beheaded.

The history of Chaumigrem is very imperfect. However, we know that he was a very great conqueror, and not at all inferior in cruelty to his predecessors. He reduced the empire of Siam and Aracan, and died in 1583; being succeeded by his son named *Pranjinoko*, then about 50 years of age. When this prince ascended the throne, the kingdom of Pegu was in its greatest height of grandeur; but by his tyranny and obstinacy he lost all that his father had gained. He died in 1599, and after his death the kingdom of Pegu became subject to Aracan. For some time past it has been tributary to the more powerful kingdom of Ava; the sovereigns of which country have hitherto been extremely cautious of permitting Europeans to obtain any settlement among them.

The air of Pegu is very healthy, and presently recovers sick strangers. The soil also is very rich and fertile in corn, rice, fruit, and roots; being enriched by the inundations of the river Pegu, which are almost incredible,

Pegu || Peirce.

dible, extending above 30 leagues beyond its channel. It produces alſo good timber of ſeveral kinds. The country abounds with elephants, buffaloes, goats, hogs, and other animals, particularly game; and deer is ſo plenty in September and October, that one may be bought for threepence or fourpence: they are very fleſhy, but have no fat. There is ſtore of good poultry; the cocks are very large, and the hens very beautiful. As for fiſh, there are many ſorts, and well taſted. In Pegu are found mines, not only of gold, iron, tin, and lead, or rather a kind of copper or mixture of copper and lead, but alſo of rubies, diamonds, and ſapphires. The rubies are the beſt in the world; but the diamonds are ſmall; and it is ſaid they are ſometimes found in the craws of poultry. Beſides, only one family has the privilege of ſelling them; and none dare open the ground to dig for them. The rubies are found in a mountain in the province of Kablan, or Kapelan, between the city of Pegu and the port of Sirian.

But for a fuller account of Pegu, and the Birman empire, ſee Asia, from p. 740 to p. 760; and for a deſcription of the temple of Shoemadoo, of which we have given an engraving, taken from Syme's Embaſſy to that kingdom, ſee alſo Asia, p. 751. Plate CCCCVII.

PEGUNTIUM, in *Ancient Geography*, (Ptolemy); *Piguntiæ*, (Pliny); a town or citadel of Dalmatia, on the Adriatic, oppoſite to the iſland Brattia, ſcarcely five miles off, and 40 miles to the eaſt of Salonæ. According to Fortis, a mountain, a large hollow, and ſubmarine ſprings are ſeen here. "This hollow (ſays he) ſeems to have been excavated by ſome ancient river. The ſprings which bubble up from under the ſea are ſo conſiderable, that they might paſs for the riſing again of a river ſunk under ground. Vrullia has the ſame derivation as the word *Vril*, which in Sclavonian ſignifies a fountain; and this etymology, rendering the name of Vrullia the *Berullia* of Porphyrogenitus analogous to that of Peguntium, ſince Πηγυ and Vril are ſynonymous, induces me to believe, that the caſtle named Peguntium by ancient geographers was ſituated in this place, and not at the mouth of the Cettina. No remarkable veſtiges of antiquity now exiſt on the ſpot; yet it is evident, by the quantity of fragments of vaſes, tiles, and ſepulchral inſcriptions now and then dug up, that this tract of coaſt was well inhabited in the Roman times. The principal cauſe why the traces of ancient habitations cannot be diſcovered about Vrullia, is the ſteepneſs of the hill above it, and the quantity of ſtones brought down from thence by the waters. The mouth of the hollow of Vrullia is dreaded by ſeamen, on account of the ſudden impetuous guſts of wind that blow from thence, and in a moment raiſe a kind of hurricane in the channel between the Primorie and the iſland of Brazza, to the great danger of barks ſurpriſed by it."

Travels into Dalmatia.

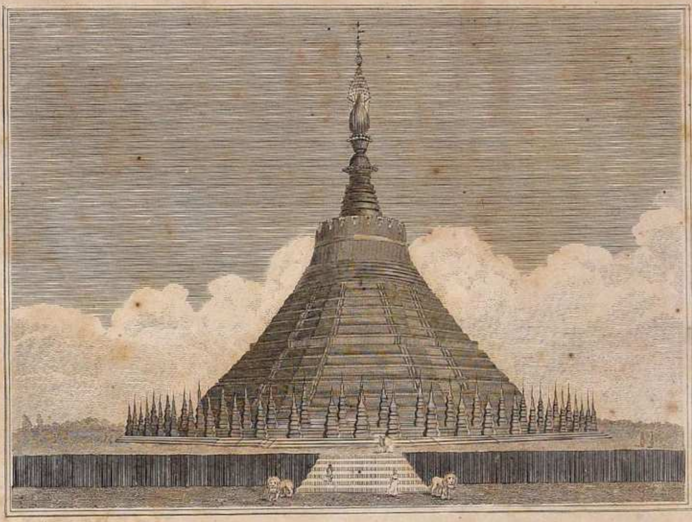
PEINE FORTE ET DURE, (Lat. *pœna fortis et dura*), ſignifies a ſpecial puniſhment inflicted on thoſe who, being arraigned of felony, refuſe to put themſelves on the ordinary trial, but ſtubbornly ſtand mute; it is vulgarly called *preſſing to death*. See Arraignment.

PEIRCE, James, an eminent diſſenting miniſter, was born at Wapping, in London, in the year 1674, and was educated at Utrecht and Leyden; after which he ſpent ſome time at Oxford, in order to enjoy the benefit of frequenting the Bodleian library. He then for two years preached the Sunday-evening's lecture at the meeting-houſe in Miles-Lane, London, and then ſettled at Cambridge. In 1713 he was removed to a congregation at Exeter, where he continued till the year 1718: when the Calviniſts among the diſſenters propoſing a ſubſcription to articles of faith to be ſigned by all the diſſenting miniſters in the kingdom, ſeveral articles were propoſed to him and Mr John Hallet, another diſſenting miniſter at Exeter, in order to their ſubſcribing them, they both refuſed, imagining this proceeding of their diſſenting brethren to be an unworthy impoſition on religious liberty and private judgment; and for this they were ejected from their congregation. Upon this, a new meeting was opened for them at Exeter, of which Mr Peirce continued miniſter till his death, in 1726. He was a man of the ſtricteſt virtue, exemplary piety, and great learning. He wrote, 1. *Exercitatio philoſophica de Homœmeria Anaxagoreæ.* 2. Thirteen pieces on the Controverſy between the Church of England and the Diſſenters. 3. Ten pieces on the Controverſy about the Ejectment at Exeter. 4. Six pieces on the Doctrine of the Trinity. 5. A Paraphraſe and Notes on the Epiſtles of St Paul to the Coloſſians, Philippians, and Hebrews. 6. An Eſſay in favour of giving the Euchariſt to Children. 7. Fourteen Sermons.

Peirce, Peireſc.

PEIRESC, Nicolas Claude Fabri, born in 1580, was deſcended from an ancient and noble family, ſeated originally at Piſa in Italy. At ten years of age, he was ſent to Avignon, where he ſpent five years in the Jeſuits college, in the ſtudy of what in Scotland and on the Continent is called *humanity*. From Avignon he was, in 1595, removed to Aix, and entered upon the ſtudy of philoſophy. In the interim, he attended the proper maſters for dancing, riding, and handling arms; in all which, though he performed the leſſons regularly, it was with reluctance: for this being done only to pleaſe an uncle, whoſe heir he was to be, he never practiſed by himſelf, eſteeming all the time loſt that was not ſpent in the purſuits of literature. During this period, his father being preſented with a medal of the emperor Arcadius, which was found at Belgenſer, Peireſc begged the favour of it; and, charmed with deciphering the characters in the exergue, and reading the emperor's name, he carried the medal with a tranſport of joy to his uncle; who for his encouragement gave him two more, together with ſome books upon the ſubject. This is the epoch of his application to antiquities, for which he became afterwards ſo famous. In 1596, he was ſent to finiſh his courſe of philoſophy under the Jeſuits at Tournon, where he turned his attention particularly to coſmography, as being neceſſary to the underſtanding of hiſtory, abating, however, nothing of his application to antiquity, in which he was aſſiſted by Petrus Rogerius, one of the profeſſors, and a ſkilful medaliſt: nor did he omit the ſtudy of humanity in general, wherein he was the maſter and inſtructor of a brother who was with him. But to do all this he was obliged to ſit up late at nights; and ſo much labour and attention, as he was naturally of a tender conſtitution, increaſed the weakneſs of his ſtomach formerly contracted, and for which he had uſed a kind of digeſtive powder. Being recalled by his uncle in 1597, he returned to Aix, and entered there upon the ſtudy of the law; which he proſecuted, however, ſo as to find leiſure to viſit and converſe frequently

the great Temple at Pegue.



The Geometrical Pen

Fig. 2.

Fig. 3.

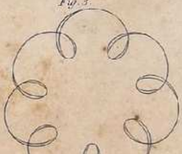


Fig. L.

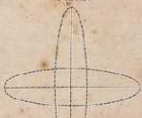
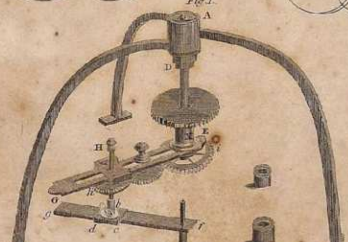


Fig. 1.

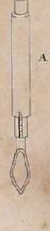


The Fountain Pen.

Fig. 3.

Fig. 2.

Fig. 1.



Engraved by W. & D. Lizars Edin^r

Peiresc. ly with Peter A. R. Bagarr, a most skilful antiquary, who was afterwards made master of the jewels to Henry IV.

The following year he went again to Avignon, to carry on his course of law under one Peter David; who, being well skilled likewise in antiquities, was pleased to see Peiresc join this study to that of the law. But Ghibertus of Naples, auditor to Cardinal Aquaviva, fed his curiosity the most, in showing him some rarities, such as he had never seen before. Ghibertus also lent him Goltzius's Treatise upon Coins, and advised him to go into Italy, especially to Rome, where he would meet with curiosities to satisfy his most ardent wishes. Accordingly, his uncle having procured a proper governor, he and his brother set out upon that tour September 1599; and passing through Florence, Bononia, and Ferrara, when he had staid a few days at Venice, he fixed his residence at Padua, in order to complete his course of law. But once a quarter, going to Venice to get cash for bills of exchange, he took these opportunities of introducing himself to the most distinguished literati there; and was particularly caressed by F. Contarin, procurator of St Mark, who was possessed of a curious cabinet of medals, and other antiquities, without knowing the value of them. This was fully shown to him by Peiresc, who likewise explained the Greek inscriptions upon his medals, and the monumental stones. After a year's stay at Padua, he set out for Rome, and arrived there October 1600, in order to be in time for seeing the jubilee; to celebrate which, the Porta Sancta would be opened in the beginning of the next year. He passed six months in this city, viewing the numberless curiosities there, and in cultivating the friendship of Galileo, by whom he was much beloved. This friendship led him to carry his researches into astronomy and natural philosophy; and he was present when Fabricius ab Aquapendente, out of a parcel of eggs upon which a hen was sitting, took one every day, to observe the gradual formation of the chick from first to last. From this time it was generally acknowledged, that he had taken the helm of learning into his hand, and began to guide the commonwealth of letters.

Having now spent almost three years in Italy, he began to prepare for his departure: and in the end of 1602, having packed up all the rarities, gems, &c. which he had procured, and put them into the road to Marseilles, he left Padua, and crossing the Alps of Geneva, went to Lyons; where receiving money he made a handsome present to his governor, who took the route of Paris. From Lyons he went to Montpelier, to improve himself in the law under Julius Parius. From Montpelier he dispatched more rarities to his uncle, who sending for him home, he arrived at Aix in November; but, bringing Parius along with him, he obtained leave to return to Montpelier in a few days. He waited upon Parius back again, under whom he continued pursuing his law studies till the end of 1603, when he returned to Aix, at the earnest request of his uncle, who, having resigned to him his senatorial dignity, had ever since the beginning of the year laboured to get the king's patent. The degree of doctor of law was a necessary qualification for that dignity. Peiresc, therefore, having kept the usual exercise, took that degree Jan. 18. 1604, when the aforesaid patent was given in to the senate, and ordered to be recorded: yet Peiresc procured leave not to be presently entered into the list of senators. The bent of his inclination was not so much to business as to advance arts and sciences, and to assist all the promoters of learning. For this purpose, he resolved to lead a single life; so that when his father had concluded a match for him with a respectable lady, he begged to be excused. Peiresc.

In 1605, he accompanied G. Varius, first president of the senate at Aix, who was very fond of him, to Paris; whence, having visited every thing curious, he crossed the water, in company with the king's ambassador, 1606, to England. Here he was very graciously received by King James I.; and having seen Oxford, and visited Camden, Sir Robert Cotton, Sir Henry Saville, and other learned men, he passed over to Holland; and after visiting the several towns and universities, with the literati in each, he went through Antwerp to Brussels, and thence back to Paris, to see the ceremony of the Dauphin's baptism; which being solemnized August 24. he returned home in September 1606, being expected for the ordering of the family affairs.

Presently after this, he purchased the barony of Rians; and at the solicitation of his uncle, having approved himself before that assembly, he was received a senator on the 1st of July 1607. January 1608 he lost his uncle; and the following year, falling himself into a dangerous fever, recovered by eating musk-melons before supper, for which he had conceived a longing. He was ordered by his physician to eat them before his meals without bread, and to drink a glass of pure wine upon them. He continued this method all his life afterwards; and grew so fond of them, that, though he could abstain from any other meat as he listed, yet towards them he professed he was unable to master himself. He frequently experienced, that in the musk-melon season he was never troubled with the gravel. In 1618, having procured a faithful copy of "the Acts of the Monastery of Maren in Switzerland," he published a second edition of that work. As it was written in defence of the royal line of France against Theodoric Piespordius, who had attempted to prove the title of the Austrian family to the French crown by right of succession, he was, upon this publication, nominated the same year, by Louis XIII. abbot of Sancta Maria Aquistriensis. He stayed in France till 1623; when, upon a message from his father, now grown old and sickly, he left Paris, where he had spent seven years and some months. He arrived at Aix in October; and not long after presented to the court a patent from the king, permitting him to continue in the function of his ancient dignity, and to exercise the office of a secular or lay person, notwithstanding that, being an abbot, he had assumed the character of a churchman. To this the court of parliament not assenting, decreed unanimously, that, being already admitted into the first rank, he should abide perpetually therein; not returning, as the custom of the court was, to the inferior auditory, wherein trials are usually had of criminal cases. In 1625, he buried his father, who had been long afflicted with the gout. In 1627, he prevailed with the archbishop of Aix to establish a post thence to Lyons, and so to Paris and all Europe; by which the correspondence constantly held with the literati everywhere was much facilitated. In 1629, he began to be much tormented with the

strangury

Peiresc || Pekin.

strangury and hæmorrhoides; and in 1631, having completed the marriage of his nephew Claudius with Margaret Alrelia, a noblewoman of the county of Avignon, he bestowed upon him the barony of Rianty, together with a grant of his senatorial dignity, only reserving the function to himself for three years. But the parliament not waiting his surrendry of it, he resented that affront so heinously, that he procured, in 1635, letters patent from the king to be restored, and to exercise the office for five years longer, which happened to be till his death: for being seized, June 1637, with a fever that brought on a stoppage of urine, this put an end to his life on the 24th of that month, in his 57th year.

The character of Peiresc may be summed up in a few words. His person was of a middle size, and of a thin habit: his forehead large, and his eyes gray; a little hawk-nosed; his cheeks tempered with red; the hair of his head yellow, as also his beard, which he used to wear long; his whole countenance bearing the marks of uncommon and rare courtesy and affability. In his diet he affected cleanliness, and in all things about him; but nothing superfluous or costly. His clothes were suitable to his dignity; yet he never wore silk. In like manner, the rest of his house was adorned according to his condition, and very well furnished; but he neglected his own chamber. Instead of tapestry, there hung the pictures of his chief friends and of famous men, besides innumerable bundles of commentaries, transcripts, notes, collections from books, epistles, and such like papers. His bed was exceedingly plain, and his table continually loaded and covered with papers, books, letters, and other things; as also all the seats round about, and the greatest part of the floor. These were so many evidences of the turn of his mind; in respect to which, the writer of his eulogе compares him to the Roman Atticus; and Bayle, considering his universal correspondence and general affistance to all the literati in Europe, dashed it out luckily enough, when he called him "the attorney general of the literary republic." The works which he published are, "Historia provinciæ Galliæ Narbonensis;" "Nobilium ejusdem provinciæ familiarum Origines, et separatim Fabriciæ;" "Commentarii rerum omnium memoria dignarum sua ætate gestarum;" "Liber de ludicris naturæ operibus;" "Mathematica et astronomica varia;" "Observationes mathematicæ;" "Epistolæ ad S. P. Urbanum VIII. cardinales Barberinos, &c.;" "Authores antiqui Græci et Latini de ponderibus et mensuris;" "Elogia et epitaphia;" "Inscriptiones antiquæ et novæ;" "Genealogia domus Austriacæ;" "Catalogus librorum biblioth. reg.;" "Poemata varia;" "Nummi Gallici, Saxonici, Britannici, &c.;" "Linguæ orientales, Hebræa, Samaritana, Arabica, Egyptiaca, et Indices librorum harum linguarum;" "Observationes in varios auctores." It is remarkable, that though Peiresc bought more books than any man of his time, yet his collection left was not large. The reason was, that as fast as he purchased, he kept continually making presents of them to such learned men as he knew they would be useful to.

Gassendi's Life of Peiresc, in English, Lond. 1657.

PEKIN, the capital city of the empire of China, in Asia, where the emperor generally resides. It is situated in a very fertile plain, 20 leagues distant from the great wall. This name, which signifies the *northern court*, is given to it, to distinguish it from another considerable city called *Nanking*, or the *southern court*. The emperor formerly resided in the latter; but the Tartars, a restless and warlike people, obliged this prince to remove his court to the northern provinces, that he might more effectually repel the incursions of those barbarians, by opposing to them a numerous militia which he generally keeps around his person. It is an exact square, and divided into two parts; namely, that which contains the emperor's palace, which is in the new city, or, as it is called, the Tartars city, because it is inhabited by Tartars ever since they conquered this empire; the other, called the *Old City*, is inhabited by the Chinese. The circuit of both these together is 52 Chinese lys, each of which contains 240 geometrical paces; being, without the suburbs, full six leagues in circumference, according to the most accurate measurement made by order of the emperor.

Pekin.

Those who have paid attention to the population of this place, reckon the number of inhabitants at 2,000,000; but we learn from Sir George Staunton, in his account of the late embassy to China, that the population of this prodigious city is not less than 3,000,000.

Grosier's Description of China.

Grosier tells us, "that the height and enormous thickness of the walls of the Tartar city excite admiration; twelve horsemen might easily ride abreast upon them; they have spacious towers raised at intervals, a bow-shot distant from one another, and large enough to contain bodies of reserve in case of necessity. The city has nine gates, which are lofty and well arched. Over them are large pavilion-roofed towers divided into nine stories, each having several apertures or portholes: the lower story forms a large hall for the use of the soldiers and officers who quit guard, and those appointed to relieve them. Before each gate a space is left of more than 360 feet: this is a kind of place of arms, inclosed by a semicircular wall equal in height and thickness to that surrounding the city. The great road, which ends here, is commanded by a pavilion-roofed tower like the first, in such manner, that, as the cannon of the former can batter the houses of the city, those of the latter can sweep the adjacent country. The streets of Pekin are straight, about 120 feet wide, a full league in length, and bordered with shops. It is astonishing to see the immense concourse of people that continually fills them, and the confusion caused by the prodigious number of horses, camels, mules, and carriages, which cross or meet each other. Besides this inconvenience, one is every now and then stopped by crowds, who stand listening to fortune-tellers, jugglers, ballad-singers, and a thousand other mountebanks and buffoons, who read and relate stories calculated to promote mirth and laughter, or distribute medicines, the wonderful effects of which they explain with all the eloquence peculiar to them.

"People of distinction oblige all their dependents to follow them. A mandarin of the first rank is always accompanied in his walks by his whole tribunal; and, to augment his equipage, each of the inferior mandarins in his suit is generally attended by several domestics. The nobility of the court, and princes of the blood, never appear in public without being surrounded by a large body of cavalry; and, as their presence is required at the palace every day, their train alone would be sufficient to create confusion in the city. It is very

 singular,

Pekin. singular, that in all this prodigious concourse no women are ever seen; hence we may judge how great the population of China must be, since the number of females in this country, as well as everywhere else, is superior to that of the other sex.

"As there is a continual influx of the riches and merchandize of the whole empire into this city, the number of strangers that resort hither is immense. They are carried in chairs, or ride on horseback; the latter is more common: but they are always attended by a guide, acquainted with the streets, and who knows the houses of the nobility and principal people of the city. They are also provided with a book, containing an account of the different quarters, squares, remarkable places, and of the residence of those in public offices. In summer there are to be seen small temporary shops, where people are served with water cooled by means of ice; and one finds everywhere eating-houses, with refreshments of tea and fruits. Each kind of provision has a certain day and place appointed for its being exposed to sale.

"The governor of Pekin, who is a Mantchew Tartar, is styled Governor of the Nine Gates. His jurisdiction extends not only over the soldiers, but also over the people in every thing that concerns the police. No police can be more active; and it is surprising to see, among an infinite number of Tartars and Chinese mixed together, the greatest tranquillity prevail. It is rare, in a number of years, to hear of houses being robbed, or people assassinated. All the principal streets have guard rooms, and soldiers patrole night and day, each having a sabre hanging from his girdle, and a whip in his hand, to correct, without distinction, those who excite quarrels or cause disorder. The lanes are guarded in the same manner; and have latticed gates, which do not prevent those from being seen who walk in them: they are always kept shut during the night, and seldom opened even to those who are known; if they are, the person to whom this indulgence is granted, must carry a lanthorn, and give a sufficient reason for his going out. In the evening, as soon as the soldiers are wanted to their quarters by beat of drum, two centinels go and come from one guard-room to another, making a continual noise with a kind of castanet, to show that they are not asleep. They permit no one to walk abroad in the night-time. They even examine those whom the emperor dispatches on business; and if their reply gives the least cause of suspicion, they have a right to convey them to the guard-room. The soldiers in each of the guard-rooms are obliged to answer every time the centinels on duty call out.

"It is by these wise regulations, observed with the greatest strictness, that peace, silence, and safety reign throughout the whole city. The governor is also obliged to go the round; and the officers stationed on the walls, and in the towers over the gates (in which are kept large kettle-drums that are beat every time the guard is relieved), are continually dispatching subalterns to examine the quarters belonging to the gates where they are posted. The least neglect is punished next morning, and the officer who was on guard is cashiered. This police, which prevents nocturnal assemblies, would appear no doubt extraordinary in Europe, and in all probability would not be much relished by our young men of fortune and ladies of quality. But the Chinese think justly: they consider it to be the duty of the magistrates of a city to prefer good order and public tranquillity to vain amusements which generally occasion many attempts against the lives and property of the citizens. It is true, the support of this police costs the emperor a great deal; for part of the soldiers we have mentioned are maintained for this purpose only. They are all infantry, and their pay is generally very high. Their employment consists not only in watching for those who may occasion disturbance in the day-time, or walk abroad during the night; they must also take care that the streets are kept clean and swept every day; that they are watered morning and evening in time of dry weather; and that every nuisance is removed. They have orders also to assist in this labour themselves; and to clear the kennels, that the water may have a free course."

The walls of the emperor's palace, including that and the gardens, are about two miles in length. "Although (says Grosier) the Chinese architecture has no resemblance to that of Europe, the imperial palace of Pekin does not fail to strike beholders by its extent, grandeur, and the regular disposition of its apartments, and by the singular structure of its pavilion-roofs, ornamented at each corner with a carved plat-band, the lower extremity of which is turned upwards. These roofs are covered with varnished tiles of so beautiful a yellow colour, that at a distance, they make as splendid an appearance as if they were gilded. Below the upper roof there is another of equal brilliancy, which hangs sloping from the wall, supported by a great number of beams, daubed over with green varnish, and interspersed with gilt figures. The second roof, with the projection of the first, forms a kind of crown to the whole edifice. The palace is a small distance from the south gate of the Tartar city. The entrance to it is through a spacious court, to which there is a descent by a marble staircase, ornamented with two large copper lions, and a balustrade of white marble. This balustrade runs in the form of a horse-shoe, along the banks of the rivulet, that winds across the palace with a serpentine course, the bridges over which are of marble. At the bottom of this first court arises a façade with three doors: that in the middle is for the emperor only; the mandarins and nobles pass through those on each side. These doors conduct to a second court, which is the largest of the palace: it is about 300 feet in length, and 50 in breadth. An immense gallery runs round it, in which are magazines, containing rich effects, which belong to the emperor as his private property; for the public treasure is entrusted to a sovereign tribunal called *Hou-pou*. The first of these magazines is filled with plate and vessels of different metals; the second contains the finest kinds of furs; the third, dresses lined with sable, ermine, minever, and foxes skins, which the emperor sometimes gives in presents to his officers; the fourth is the depository of jewels, pieces of curious marble, and pearls fished up in Tartary; the fifth, consisting of two stories, is full of wardrobes and trunks, which contains the silk stuffs used by the emperor and his family; the rest are filled with bows, arrows, and other pieces of armour taken from the enemy or presented by different princes.

"The royal hall, called *Tai-hotien*, or the Hall of the

Pekin. ‖ Pelagius.

the Grand Union, is in this ſecond court. It is built upon a terrace about 18 feet in height, incruſted with white marble, and ornamented with balluſtrades of excellent workmanſhip. Before this hall all the mandarins range themſelves, when they go, on certain days, to renew their homage, and perform thoſe ceremonies that are appointed by the laws of the empire. This hall is almoſt ſquare, and about 130 feet in length. The ceiling is carved, varniſhed green, and loaded with gilt dragons. The pillars which ſupport the roof within are ſix feet in circumference towards the baſe, and are coated with a kind of maſtich varniſhed red; the floor is partly covered with coarſe carpets, after the Turkiſh manner; but the walls have no kind of ornament, neither tapeſtry, luſtres, nor paintings.

"The throne, which is in the middle of the hall, conſiſts of a pretty high alcove, exceedingly neat. It has no inſcription but the character *ching*, which the authors of this relation have interpreted by the word *holy*: but it has not always this ſignification; for it anſwers better ſometimes to the Latin word *eximius*, or the Engliſh words *excellent*, *perfect*, *moſt wiſe*. Upon the platform oppoſite to this hall ſtand large veſſels of bronze, in which incenſe is burnt when any ceremony is performing. There are alſo chandeliers ſhaped like birds and painted different colours, as well as the wax-candles that are lighted up in them. This platform is extended towards the north, and has on it two leſſer halls; one of them is a rotunda that glitters with varniſh, and is lighted by a number of windows. It is here that the emperor changes his dreſs before or after any ceremony. The other is a ſaloon, the door of which opens to the north: through this door the emperor muſt paſs, when he goes from his apartment to receive on his throne the homage of the nobility; he is then carried in a chair, by officers dreſſed in long red robes bordered with ſilk, and caps ornamented with plumes of feathers. It would be difficult to give an exact deſcription of the interior apartments which properly form the palace of the emperor, and are ſet apart for the uſe of his family. Few are permitted to enter them but women and eunuchs."

The temples and the towers of this city are ſo numerous, that it is difficult to count them. Proviſions of all kinds are exceeding plentiful, they being, as well as the merchandiſes, brought from other parts by means of canals cut from the rivers, and always crowded with veſſels of different ſizes, as well as from the adjacent country. An earthquake which happened here in 1731 buried above 100,000 perſons in the ruins of the houſes which were thrown down. E. Long. 116. 41. N. Lat. 39. 54.

We have already, under the article OBSERVATORY, mentioned the famous obſervatory in this city, of which we ſhall give this further account from the Univerſal Hiſtory. "The Chineſe had thought nothing in the univerſe could equal in magnificence this famous place; and one of the moſt celebrated mathematicians of the royal academy of Paris hath made no ſcruple to repreſent it as one of the greateſt prodigies of art and ingenuity, of beauty and magnificence; and yet, when this celebrated ſtructure came to be viewed by more proper and unbiaſſed judges, it appears to have been of little worth as to its ancient machines, and leſs as to its ſituation; and that all that is now valuable in it is owing to the improvements made by Father Verbieſt a Flemiſh Jeſuit, who cauſed a new ſet of inſtruments to be made, with extraordinary care, neatneſs, and preciſion.

Mod. Un. Hiſt. vol. vii.

"This fabric ſtands in a court of a moderate extent, and is built in the form of a ſquare tower, contiguous to the city wall on the inſide, and raiſed but ten or twelve feet above its bulwark. The aſcent up to the top is by a very narrow ſtaircaſe; and on the platform above were placed all the old inſtruments, which, though but few, took up the whole room, till Father Verbieſt introduced his new apparatus, which he diſpoſed in a more convenient order. Theſe are large, well caſt, and embelliſhed; and were the neatneſs of the diviſions anſwerable to the work, and the teleſcopes faſtened to them according to the new method, they would be equal to thoſe of Europe; but the Chineſe artificers were, it ſeems, either too negligent, or incapable of following his directions. As to the old inſtruments, they were, by order of the emperor Kang-hi, ſet aſide as uſeleſs, and laid in the hall near the tower, where they may be ſeen through a croſs-barred window, all covered with ruſt, and buried in oblivion.

"In this famed obſervatory there are five mathematicians employed night and day, each in a proper apartment on the top of the tower, to obſerve all that paſſes over their heads: one of them is gazing towards the zenith, and the others towards the four points of the compaſs, that nothing may eſcape their notice. Their obſervations extend not only to the motions of the heavenly bodies, but to fires, meteors, winds, rain, thunder, hail ſtorms, and other phenomena of the atmoſphere; and theſe are carefully entered in their journals, and an account of them is brought every morning to the ſurveyor of the mathematics, and regiſtered in his office."

PELAGIANS, a Chriſtian ſect who appeared about the fifth or end of the fourth century. They maintained the following doctrines: 1. That Adam was by nature mortal, and, whether he had ſinned or not, would certainly have died. 2. That the conſequences of Adam's ſin were confined to his own perſon. 3. That new-born infants are in the ſame ſituation with Adam before the fall. 4. That the law qualified men for the kingdom of heaven, and was founded upon equal promiſes with the goſpel. 5. That the general reſurrection of the dead does not follow in virtue of our Saviour's reſurrection. 6. That the grace of God is given according to our merits. 7. That this grace is not granted for the performance of every moral act; the liberty of the will, and information in points of duty, being ſufficient, &c. The founder of this ſect was

PELAGIUS, a native of Great Britain; but whether of England, Scotland, or Wales, is as uncertain as it is immaterial (A). He was born towards the cloſe of the fourth century, and educated in the monaſtery of

(A) Dr Henry thinks he was born in North Wales; that his real name was Morgan, of which Pelagius is

Pelagius. of Banchor, in Wales, of which he became a monk, and afterwards abbot. In the early part of his life he went over to France, and thence to Rome, where he had the insolence to promulgate certain opinions somewhat different from those of the infallible church. His morals being irreproachable, he gained many disciples; and the dreadful heresy made so rapid a progress, that, for the salvation of souls, it became necessary for the pope to exert his power. Pelagius, to avoid the danger, in the year 409 passed over to Sicily, attended by his friend and pupil Celestius. In 411 they landed in Africa, continued some time at Hippo, and were present at the famous conference between the Catholics and Donatists which was held at Carthage in 412. From thence they travelled into Egypt; and from Egypt, in 415, to Palestine, where they were graciously received by John bishop of Jerusalem. In the same year Pelagius was cited to appear before a council of seventeen bishops, held at Diospolis. They were satisfied with his creed, and absolved him of heresy. The African bishops, however, being displeased with their proceedings, appealed to the Roman pontiff: he first approved, and afterwards condemned, the opinions of Pelagius, who, with his pupil Celestius, was publicly excommunicated; and all the bishops who refused to subscribe the condemnation of the Pelagian heresy were immediately deprived. What became of him after this period is entirely unknown; but it seems very probable that he retired to Banchor, and died abbot of that monastery. He wrote, 1. *Expositionum in epist. Paulinas*, lib. xiv. 2. *Epistola ad Demetriadem de virginitate*. 3. *Explanationis symboli ad Damasum*. 4. *Epistolæ ad viduam duæ*. 5. *De libero arbitrio*. These and many other fragments are scattered among the works of St Jerome. They are also collected by Garnerius, and published in Append. op. Mercatoris, p. 373. *Cave*.

Pelagius, Pelagosa. PELAGOSA, an island in the Adriatic, which, together with several rocks that appear above water near it, are the remains of an ancient volcano. "I will not assure you (says Fortis) that it was thrown up out of the sea like several other islands in the Archipelago, though there is some ground to suspect this to have been the case; because we find no precise mention of it in the most ancient geographers. It should seem that it ought not to be confused with the Diomedee, from which it is 30 miles distant; yet it is not impossible that they have reckoned it among them. The lava which forms the substance of this island, is perfectly like the ordinary lava of Vesuvius, as far as I could discover in passing near it. If a naturalist should land there, and visit on purpose the highest parts of the island, perhaps we might then know whether it has been thrown up by a submarine *Travels into Dalmatia.*

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is a translation; and that he was born on the 13th of November A. D. 354, the same day with his great antagonist St Augustin. The same learned historian gives us the following account of Pelagius and his great coadjutor Celestius. "He received a learned education in his own country, most probably in the great monastery of Banchor near Chester, to the government of which he was advanced A. D. 404. He was long esteemed and loved by St Jerome and St Augustin, who kept up a friendly correspondence with him by letters before they discovered the heretical pravity of his opinions; for Pelagius, being a cautious and artful man, for some time vented his peculiar notions as the sentiments of others, without discovering that they were his own. At length, however, he threw off the mask, and openly published and defended his doctrines at Rome about the beginning of the fifth century. This involved him in many troubles, and drew upon him the indignation of his former friends St Jerome and St Augustin, who wrote against him with great acrimony. He is acknowledged, even by his adversaries, to have been a man of good sense and great learning, and an acute disputant, though they load him with the most bitter reproaches for his abuse of these talents. His personal blemishes are painted in very strong colours; and he is represented by these good fathers, in the heat of their zeal, as a very ugly fellow, 'broad-shouldered, thick-necked, fat-headed, lame of a leg, and blind of an eye.' Even the most northern parts of this island (Britain) produced some men of learning in this period. Celestius, the disciple and friend of Pelagius, was a Scotsman, who made a prodigious noise in the world by his writings and disputations about the beginning of the fifth century. He defended and propagated the peculiar opinions of his master Pelagius with so much learning, zeal, and success, that those who embraced these opinions were frequently called Celestins. Before he became acquainted with these doctrines he wrote several books, which were universally admired for their orthodoxy, learning, and virtuous tendency. After he had spent his youth in his own country in a studious privacy, he travelled for his further improvement to Rome, where he became acquainted with Rufinus and Pelagius, and was by them infected with their heresies. From that time he became the most indefatigable and undaunted champion of these heresies, and thereby brought upon himself the indignation of the orthodox fathers of these days, who gave him many very bad names in their writings. St Jerome, whose commentaries on the Ephesians he had presumed to criticise, calls him, 'an ignorant, stupid fool, having his belly swelled and distended with Scots pottage; a great, corpulent, barking dog, who was fitter to kick with heels than to bite with his teeth; a Cerberus, who, with his master Pluto (Pelagius), deserved to be knocked on the head, that they might be put to eternal silence.' Such were the flowers of rhetoric which these good fathers employed against the enemies of the orthodox faith! But candour obliges us to observe, that this was perhaps more the vice of the age in which they lived than of the men. Both Pelagius and Celestius were very great travellers; having visited many different countries of Asia and Africa, as well as Europe, with a view to elude the persecutions of their enemies, and to propagate their opinions. It is no inconsiderable evidence of their superior learning and abilities, that their opinions gained great ground in all the provinces both of the eastern and western empire, in spite of the writings of many learned fathers, and the decrees of many councils against them. 'The Pelagian and Celestian heresy (says Photius) not only flourished in great vigour in the West, but was also propagated into the East.'

rine volcano, as the island near Santerini was in our age; or if we ought to believe it the top of some ancient volcanic mountain, of which the roots and sides have been covered by the waters, which divided Africa from Spain, forming the straits of Gibraltar; an invasion that no one can doubt of who has examined the bottoms and shores of our sea. The Lissan fishermen say, that Pelagosa is subject to frequent and violent earthquakes; and the aspect of the island proves at first sight, that it has suffered many revolutions; for it is rugged, ruinous, and subverted."

PELAIAH, a Levite (Nehem. viii. 7. x. 10.). He was one of the principal Levites that returned from captivity, and was one of those that signed the covenant that Nehemiah renewed with the Lord.

PELALIAH, son of Amazi and father of Jeroham, of the family of Pashur son of Malchiah, of all whom mention has been made: he was of the race of the priests (Nehem. xi. 12.).

PELASGI. See PELASGIOTIS.

PELASGIA (Pliny); the ancient name of *Lesbos*; so called from the Pelasgi, its first inhabitants (Diodorus Siculus). Also the ancient name of *Peloponnesus*, from Pelasgius, a native of the country (Nicolaus Damascenus, Ephorus).

PELASGICUM (Pausanias, Pliny); the north wall of Athens; so called from the builders, the Pelasgi. There was an execration pronounced on any that should build houses under this wall, because the Pelasgi, while dwelling there, entered into a conspiracy against the Athenians (Thucydides).

PELASGIOTIS, a third part of Thessaly (Strabo); so called from a very ancient people, the Pelasgi, called *Pelasgiotæ* (Ptolemy); who formerly, together with the Æolians, occupied Thessaly, and thence that part was called *Pelasgicum Argos*; besides many other parts of Greece. Their name *Pelasgi*, or *Pelargi*, denoting storks, was given them from their wandering roving life (Strabo). The poets extend the appellation to Greeks in general. *Pelasgus*, the epithet. Some of the inhabitants of Crete were called *Pelasgi* (Homer); who thus also calls the neighbouring people to the Cilicians in Troas. The Pelasgi were originally of Arcadia, (Hesiod); but Æschylus makes Argos, near Mycenæ, their country. The Pelasgiotis was situated between Pieria and Macedonia to the north and west, Thessaliotis to the south, and Magnesia to the east, (Strabo, Pliny).

PELATÆ, were free-born citizens, among the Athenians, who by poverty were reduced to the necessity of serving for wages. During their servitude they had no vote in the management of public affairs, as having no estate to qualify them; but this restriction was removed whenever they had released themselves from their servile situation, which they were allowed to do when able to support themselves. While they continued servants, they had also a right to change their masters. We find them sometimes distinguished by the name of *Thetæ*.

PELATIAH, son of Hananiah, and father of Ishi, of the tribe of Simeon. He subdued the Amalekites upon the mountain of Seir (1 Chron. iv. 42.). The time of this action is unknown.

PELATIAH, son of Benaiah, a prince of the people, who lived in the time of Zedekiah king of Judah, and opposed the wholesome advice given by Jeremiah, to submit to King Nebuchadnezzar. Ezekiel (xi. 1, 2, 3, 4.) being a captive in Mesopotamia, had a vision, in which he saw five and twenty men at the door of the temple of Jerusalem, among whom were Jaazaniah the son of Azur, and Pelatiah the son of Benaiah, who were the most remarkable. Then the Lord said to him, "Son of man, these are the men that have thoughts of iniquity, and who are forming pernicious designs against this city, saying, Have not the houses been built a long time? Jerusalem is the pot, and we are the flesh. Thus saith the Lord: You have made great havock in this city, and have filled its streets with dead bodies. These men are the flesh, and the city is the pot. But as for you, I will make you come forth from the middle of this city, and I will make you perish by the hand of your enemies." As he was prophesying in this manner, Pelatiah the son of Benaiah died.

PELE, (Stephanus). There were two towns of this name in Thessaly; the one subject to Eurypylus, the other to Achilles; both extinct. *Peleus* the gentilitious name (*id.*)

PELEG, son of Eber, was born in the year of the world 1757. The scripture says his father gave him the name of Peleg, signifying division, because in his time the earth began to be divided (Gen. xi. 16. x. 25.); whether it was that Noah had begun to distribute the earth among his descendants, some years before the building of Babel; or that Peleg came into the world the same year that Babel was begun, and at the division of languages; or that Eber by a spirit of prophecy gave his son the name of *Peleg* some years before the tower of Babel was begun, is not absolutely certain. That which here perplexes the interpreters is, first, that Peleg came into the world not above 100 years after the deluge. But it should seem, that the number of men was not then sufficient for such an undertaking as that of Babel. Secondly, Joktan the brother of Peleg had already thirteen sons at the time of this dispersion, which happened after the confusion of Babel (Gen. x. 26, 27, 28, &c.). Peleg being born in the thirty-fourth year of Eber (Gen. xi. 16.), it is impossible his brother Joktan should have such a number of children at the birth of Peleg. It seems therefore that he was not born at the time of the dispersion. To this may be answered, that Moses has there enumerated the names of the thirteen sons of Joktan (in Gen. x. 26.) by way of anticipation, though they were not born till a good while after the confusion at Babel; but as they possessed a very large country, it was convenient to take notice of them, and to name them among the other descendants of Noah, who divided the provinces of the east among themselves. However this may have been, at the age of thirty years Peleg begat Reu; and he died at the age of 239.

PELETHITES. The Pelethites and Cherethites were famous under the reign of King David. They were the most valiant men in the army of that prince, and had the guard of his person. See Ezekiel xxv. 16. Zephaniah ii. 5. 1 Sam. xxx. 14. 2 Samuel xv. 18. xx. 7. *Patrick's Comm. Pool's Annot.* and *Delany's Hist. of the Life of David*.

PELETHRONII, a name or epithet given to the Lapithæ, either because they inhabited the town of Pelethronium at the foot of Mount Pelion in Thessaly,

ſaly, or becauſe one of their number bore the name of *Pelethronius*. It is to them, we are told, that mankind are indebted for the invention of the bit with which they tamed their horſes with ſo much dexterity.

PELETHRONIUM (Nicander and Scholiaſt); a town of Theſſaly, ſituated in a flowery part of Mount Pelion; and hence the appellation *throna*, ſignifying "flowers." Lucan ſays the Centaurs were natives of that place; to whom Virgil aſſigns Mount Othrys. Moſt authors, however, aſcribe the breaking of horſes to the Centaurs. Some make the Lapithæ and Centaurs the ſame; others a different people; allowed however to be both of Theſſaly. Their ſtory is greatly involved in fable. See LAPITHUS.

PELEUS, in *Fabulous Hiſtory*, a king of Theſſaly, ſon of Æacus and Endeis, the daughter of Chiron. He married Thetis one of the Nereids, and was the only mortal man who ever married an immortal. He was concerned in the murder of his brother Phocus, and was therefore obliged to leave his father's dominions. He fled to the court of Eurytus the ſon of Actor, who reigned at Phthia, or according to the opinion of Ovid, the truth of which is queſtioned, to Ceyx king of Trachinia. He was purified of his murder by Eurytus, with the uſual ceremonies, and the king gave him his daughter Antigone in marriage. After this, as Peleus and Eurytus went to the chaſe of the Calydonian boar, the father-in-law was accidentally killed by an arrow which his ſon-in-law had aimed at the beaſt. This unfortunate accident obliged him to baniſh himſelf from the court of Phthia, and he went to Iolchos, where he was alſo purified of the murder of Eurytus by Acaſtus the king of the country. His reſidence at Iolchos was ſhort: Aſtydamia the wife of Acaſtus fell in love with him; but when ſhe found him inſenſible to her paſſionate declarations, ſhe accuſed him of attempts upon her virtue. The king her huſband partly believed the accuſations of his wife; but not willing to violate the laws of hoſpitality, by putting him inſtantly to death, he ordered his officers to conduct him to Mount Pelion, on pretence of hunting, and there to tie him to a tree and to leave him a prey to the wild beaſts of the place. The orders of Acaſtus were faithfully obeyed: but Jupiter knowing the innocence of his grandſon Peleus, ordered Vulcan to ſet him at liberty. As ſoon as he had been delivered from danger, Peleus aſſembled his friends in order to puniſh the ill treatment which he had received from Acaſtus. He took Iolchos by force, drove the king from his poſſeſſions, and put to death the wicked Aſtydamia. On the death of Antigone, Peleus made love to Thetis, of whoſe ſuperior charms Jupiter himſelf had been enamoured. His pretenſions were rejected; for as he was but a mortal, the goddeſs fled from him with the utmoſt abhorrence, and the more effectually to evade his inquiries, ſhe generally aſſumed the ſhape of a bird, or a tree, or of a tygreſs. Peleus's paſſion was fanned by refuſal: he offered a ſacrifice to the gods; and Proteus informed him, that to obtain Thetis, he muſt ſurpriſe her while ſhe was aſleep in her grotto, near the ſhores of Theſſaly. This advice was immediately attended to; and Thetis, unable to eſcape from the graſp of Peleus, at laſt conſented to marry him. Their nuptials were celebrated with the greateſt ſolemnity, all the gods attending and making them each the moſt valuable preſents. The goddeſs of Diſcord was the only one of the deities who was abſent; and ſhe puniſhed this ſeeming neglect by throwing an apple in the midſt of the aſſembly of the gods, with the inſcription of *Detur pulchriori*. The celebrated Achilles was the fruit of this marriage, whoſe education was early entruſted to the Centaur Chiron, and afterwards to Phœnix, the ſon of Amyntor. Achilles, it is well known, went to the Trojan war, at the head of his father's troops; and Peleus gloried in having a ſon who was ſuperior to all the Greeks in valour and intrepidity. His death, however, was the ſource of great grief to Peleus; but Thetis, to comfort her huſband, promiſed him immortality, and ordered him to retire into the grottoes of the iſland of Leuce, where he ſhould ſee and converſe with the manes of his ſon. Peleus had a daughter called *Polydora*, by Antigone.

PELEW ISLANDS, a cluſter of ſmall iſlands ſituated between the latitudes of 5° and 7° north, and the longitudes 134° and 136° eaſt. Various conjectures have been formed reſpecting the time of their firſt diſcovery by Europeans. Mr Keate, the editor of the only voyage in which we have any account of their climate, ſoil, and produce, together with the manners of their inhabitants, thinks they were firſt noticed by the Spaniards from the Philippines, and by them named *Palos* from the number of trees growing in them reſembling the maſts of ſhips. This conjecture has been vehemently oppoſed by a critic, who affirms that the whole of Mr Keate's introduction is erroneous, and that the iſlands in queſtion were firſt diſcovered by a French Jeſuit named *Pere Papin*. The Jeſuit, he imagines, was directed to them by one of the inhabitants, who had found his way to the Moluccas, where he was baptized. They are ſaid to have been again noticed by *P. Centova* in 1724, who ſaw at Agdane, the capital of the Merian iſlands, ſome of the inhabitants; and from their account gives a deſcription not very favourable of theſe harmleſs iſlanders. Centova's deſcription is to be found in the 15th volume, and the relation of the diſcovery by P. Papin in the 11th volume, of *Lettres Edifiantes et Curieuſes*, publiſhed at Paris 1781.

The lateſt and moſt authentic account of them, however, is given from the Journals of Captain Wilſon of the Antelope, a packet belonging to the Eaſt India company, which was wrecked upon one of them in Auguſt 1783. This ſhip was fitted out in England by the court of directors in the ſummer 1782, as was then generally underſtood, for a ſecret expedition. Whatever may have been her deſtination, as ſhe was proceeding from Macao in ſqually weather, the man who, on the night of the 10th of Auguſt, had the look-out, ſuddenly called out *Breakers!* But the ſound of the word had ſcarce reached the ears of the officer on deck, before the ſhip ſtruck and ſtuck faſt; and in leſs than an hour bulged and filled with water. Having ſecured the gunpowder, ſmall arms, bread, and ſuch other proviſions as were liable to be ſpoiled by water, Captain Wilſon, after many difficulties, effected a landing. The crew of the Antelope conſiſted of 33 Europeans beſides the captain, and 16 Chineſe: and the only poſſible means by which they could be delivered from an iſland, which at firſt appeared to them uninhabited, was by building a ſhip capable of tranſporting them to the neareſt Euro-

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pean settlement in that quarter of the globe. Whilst they were meditating upon this undertaking, the natives appeared on the second day after their arrival; and their intercourse with them was facilitated by means which appear as singular as they were providential. Captain Wilson had a servant recommended to him at Macao, who spoke both the Malay and English languages perfectly well; and they had not been long at Pelew before they had the good fortune to meet with a Malay, who had been thrown by a tempest upon this very spot about a year before, and had made himself acquainted with the language of the country; so that by this extraordinary event each party had an interpreter who could readily explain their wants and desires, and by that means prevent a number of misconceptions which might have arisen from making use of signs and gestures only.

The natives are all of a deep copper colour, going perfectly naked. They are of a middling stature, very straight, muscular, and well formed; but their legs, from a little above their ancles to the middle of their thighs, are tatooed so very thick, as to appear dyed of a far deeper colour than the rest of their skin. Their hair is of a fine black, long, and rolled up behind, in a simple manner, close to the back of their heads, which appeared both neat and becoming; but few of them had beards, it being the general custom to pluck them out by the roots.

They began by stroking the bodies and arms of the English, or rather their waistcoats and coat sleeves, as if they doubted whether the garment and the man were not of the same substance; and as the Malay explained the circumstances to them, our people were greatly surprised at the quickness with which they seemed to comprehend every information he gave them. The next thing they noticed was our people's white hands, and the blue veins of their wrists; the former of which they seemed to consider as artificial, and the other as the English manner of tatooing. After being satisfied in this particular, they expressed a further wish to see their bodies; and, among other things, were greatly surprised at finding hair on their breasts, it being considered by them as a great mark of indelicacy, as it is their custom to eradicate it from every part of the body in both sexes.

They afterwards walked about, testifying great curiosity at every thing they saw, but at the same time expressing a fear that they might be thought too intruding. As our people were conducting them to the tents, one of the natives picked up a bullet, which had been casually dropped on the ground, and immediately expressed his surprise, that a substance so small to the eye should be so very ponderous to the touch; and on their entering the tent, a large Newfoundland dog, and a spaniel, which had been tied up there to prevent their being lost, set up a most violent barking, and the natives a noise but little less loud, which at first it was not easy to account for. They ran in and out of the tent, and seemed to wish that they might be made to bark again. This the Malay soon explained to be the effect of their joy and surprise, as these were the first large animals they had ever seen, there being no quadrupeds of any species on these islands, except a very few grey rats in the woods.

After some time it was agreed on by Captain Wilson and his people, that some of the crew should be sent to the king of the place, in order to solicit his friendship, and intreat his permission to build a vessel that might carry them back to their own country. This business was allotted to the captain's brother; and during his absence, Raa Kook, the king's brother, and several of the natives, remained with our people. This amiable chief seemed to place an entire confidence in those he was among; he endeavoured to accommodate himself to their manners; would sit at table as they did, instead of squatting on his hams; and inquired particularly into the principles and causes of every thing he observed about him, lending his personal assistance in all that was going forward, and even desiring the cook to let him aid him in blowing the fire.

In order to conciliate their affections, Captain Wilson had presented Arra Kooker, another of the king's brothers, with a pair of trowsers; but having conceived a greater passion for a white shirt, one was immediately given to him; which he had no sooner put on, than he began to dance and jump about with so much joy, that every body was diverted by his singular gestures, and the contrast which the linen formed with his skin. This prince was about 40, of a short stature, but so plump and fat that he was nearly as broad as he was long. He possessed an abundant share of good humour, and a wonderful turn for mimickry; and had besides a countenance so lively and expressive, that though our people at this time were strangers to almost all he said, yet his face and gestures made them accurately comprehend whatever he was describing.

After three or four days, Abba Thulle the king arrived with a great retinue. He was received with every mark of respect by the ship's company, who were exercised before him, and fired three volleys in different positions. The surprise of the natives, their hooting, hallooing, jumping, and chattering, produced a noise almost equal to the discharge of the muskets; and when one of the men shot a bird, which was done to display the effect of their arms, the surprise it occasioned was wonderful. Some of the natives ran for it, and carried it to the king, who examined it with great attention, but was unable to comprehend how it could be wounded, not having seen any thing pass out of the gun.

Raa Kook expressed great impatience to show the king whatever had impressed his own mind; and taking his brother by the hand, led him to a grindstone which was fixed behind one of the tents. He immediately put it in motion, as he had frequently done before; at the rapidity of which the king was greatly astonished, particularly when he was informed that it would sharpen iron. Captain Wilson ordered a hatchet to be brought and ground, that they might more readily perceive its operation, when Raa Kook eagerly seized the handle, and began turning it, appearing highly delighted to let his brother see how well he understood it. The whole appeared like something supernatural; but the circumstance which most bewildered their ideas was, how the sparks of fire could come, and how a stone so well wetted could become so soon dry.

The king then visited the different tents, and inquired about every thing he saw: all was novelty, and of course interested his attention. When he got to the tent where the Chinese men were, who had been brought with them from Macao, Raa Kook, whose retentive mind never lost

loft a fingle trace of any thing he had been informed of, acquainted the king that thefe were a people quite different from the Englifh, and that he had learnt there were many other nations befides thefe interfperfed through the world, fome of which fought with guns and others with boarding-pikes, an inftrument which he held very cheap in comparifon with the former.

When the king heard his brother difcourfing about a variety of nations, who all fpoke differently, and had before him the example of the Chinefe, whofe language was not the fame with the Englifh, he appeared inftantly thoughtful and ferious, as if ftruck by conceptions which had never before croffed his mind. He remained a while penfive and bewildered; and this circumftance impreffed on every one at the time an idea that there was every reafon to imagine that there had never been a communication between thofe people and any other nation: and indeed it is evident, that if Pere Papin did really vifit them in 1710, they had before 1783 loft the remembrance of every trace of European manners. This indeed is not furprifing, as they had no other record than knots fimilar to the quipes of Peru at the landing of the Spaniards.

Raa Kook would now fhow his brother the kitchen, which was in the hollow of a rock, a little above the cove. It was at the time when the cook was preparing dinner; and though the implements were exceedingly fcanty, an iron pot, a tea kettle, a tin fauce-pan, with a poker, a pair of tongs, and a frying-pan, were here of fufficient confequence to excite admiration; nor were the bellows now forgotten by Raa Kook, who taking them up, as he explained their ufe to the king, feemed ambitious to let his brother fee what an adept he was at blowing. The little bald cook, who was always clofe fhaven, and never wore any thing on his head, was likewife pointed out to the king as an object of merriment and curiofity.

Some time after this the king requefted five of Captain Wilfon's men to attend him in a war he was going to make againft the inhabitants of a neighbouring ifland called *Oroolong*, who, as he faid, had done him an injury. But before this requeft was made known, he had long ftruggled with a delicacy of fentiment which no one would have expected to find in regions fo disjoined from the reft of mankind. This was no other than that it might prove a temporary inconvenience to the unfortunate ftrangers who had fought his protection, and might be confidered by them as an ungenerous proceeding. It was, however, no fooner made known, than Captain Wilfon inftantly complied; and every face, which had before been clouded with doubt and apprehenfion, became immediately brightened and gay.

In this enterprife little more was done than braving their enemies, ftripping fome cocoa-nut trees of their fruit, and carrying off a number of yams and other provifions; but in another, which was undertaken againft the ifland of Artingall, they were more fuccefsful, and fhowed figns of the fame fanguinary difpofition which fome demon has infufed into the whole human race. Nine prifoners of war who had been taken upon this occafion were cruelly put to death; and notwithftanding the Englifh ftrongly remonftrated againft this proceeding, all the arguments they could ufe were of no avail. In juftification of their conduct, they alleged the neceffity of doing it for their own fecurity, declaring that they had formerly only detained them as menial fervants, but that they always found means to get back to their own country, and return with fuch a force as frequently made great depredations.

Having given this general account of the character and conduct of thefe hitherto unknown people, we now proceed to lay before our readers what we have learned of their government, cuftoms, manners, and arts, together with a defcription of the face of their country. In this the editor of Captain Wilfon's voyage muft be our guide; and if our narrative do not fatisfy the man of fcience, it is to be obferved, that the Antelope was not a fhip fent out purpofely to explore undifcovered regions, nor were there people on board properly qualified to eftimate the manners of a new race of men; they had amongft them no philofophers, botanifts, or draughtfmen, experienced in fuch fcientific purfuits as might enable them to examine with judgment every object which prefented itfelf. Diftrefs threw them upon thefe iflands; and while they were there, all their thoughts were occupied on the means of liberating themfelves from a fituation of all others the moft afflicting to the mind, that of being cut off for ever from the fociety of the reft of the world.

It, however, clearly appears, from their uniform teftimony, that at Pelew the king was confidered as the firft perfon in the government.

"He was looked up to as the father of his people; and though divefted of all external decorations of royalty, had every mark of diftinction paid to his perfon. His *rupacks* or chiefs approached him with the greateft refpect; and his common fubjects, whenever they paffed near him, or had occafion to addrefs him, put their hands behind them, and crouched towards the ground. Upon all occurrences of moment, he convened the rupacks and officers of ftate; their councils were always held in the open air, where the king firft ftated the bufinefs upon which he had affembled them, and fubmitted it to their confideration. Each rupack delivered his opinion, but without rifing from his feat; and when the matter before them was fettled, the king ftanding up put an end to the council.

"When any meffage was brought him, whether in council or elfewhere, if it came by one of the common people, it was delivered at fome diftance in a low voice to one of the inferior rupacks, who, bending in a humble manner at the king's fide, delivered it in the fame manner with his face turned afide. His commands appeared to be abfolute, though he acted in no important bufinefs without the advice of his chiefs; and every day in the afternoon, whether he was at Pelew or with the Englifh, he went to fit in public for the purpofe of hearing any requefts, or of adjufting any difference or difpute which might have arifen among his fubjects."

But thefe, according to our editor, feldom happened; for as their real wants were but few, and they faw nothing to create artificial ones; every one was chiefly occupied with his own humble purfuits; and as far as the fhip's crew, who remained among them about three months, could decide, they appeared to conduct themfelves towards each other with the greateft civility and benevolence; never wrangling or entering into quarrelfome contentions, as is cuftomary among thofe who call themfelves a polifhed and enlightened people. Even when

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when children showed a disposition of this kind, they strongly marked their displeasure, by stifling with rebuke their little animosities.

The character of the king is thus drawn by the editor: "The excellent man who reigned over these sons of nature, showed himself in every part of his conduct firm, noble, generous, and benevolent; there was a dignity in all his deportment, a gentleness in all his manners, and a warmth and sensibility about his heart, that won the love of all who approached him. Nature had bestowed on him a contemplative mind, which he had improved by those reflections that good sense dictated and observation confirmed. The happiness of his people seemed to be always in his thoughts. In order more effectually to stimulate them to useful labour, he had himself learnt all the few arts they possessed, and was looked on in some of them to be the best workman in his dominions. Placed as he was by Providence in its obscurer scenes, he lived beloved by his chiefs, and revered by his people; over whom, whilst he preserved a dignity which distinguished his superior station, he reigned more as the father than the sovereign. The eyes of his subjects beheld their naked prince with as much awe and respect as those are viewed with who govern polished nations, and are decorated with all the dazzling parade and ornaments of royalty; nor was the purple robe or the splendid diadem necessary to point out a character which the masterly hand of nature had rendered so perfect.

Next in power to the king was his brother Raa Kook, who was official general of all his forces. It was his duty to summon the rupacks to attend the king for whatever purpose they were wanted. He was also his presumptive heir; the succession of Pelew not going to the king's children till it had passed through his brothers; so that after the demise of Abba Thulle, the sovereignty would have descended to Raa Kook; on his demise to Arra Kooker; and on the death of this last it would have reverted to Qui Bill, the king's eldest son, when Lee Boo, his second son, of whom we have much to say, would have become the hereditary general.

The office of first minister is described as follows: "The king was always attended by a particular chief or rupack, who did not appear to possess any hereditary office, but only a delegated authority. He was always near the king's person, and the chief who was always first consulted; but whether his office was religious or civil, or both, our people could not learn with any certainty. He was not considered as a warrior, or ever bore arms, and had only one wife, whereas the other rupacks had two. The English were never invited to his house, or introduced into it, although they were conducted to those of almost every other chief."

Of the rupacks it is observed, "That they could only be regarded as chiefs or nobles; they were not all of the same degree, as was plain by a difference in the *bone* (A) they wore: they generally attended the king, and were always ready at his command to accompany him on any expedition with a number of canoes properly manned, and armed with darts and spears, who were to remain with him till they had his permission to return home with their dependents. In this part of their government we may trace an outline of the feudal system; but from the few opportunities our people had of investigating points of internal government, it appeared that the titles of *rupacks* were personal badges of rank and distinction; nor did they apprehend they were hereditary honours, unless in the reigning family, who must of necessity be of this class."

As to property, it was understood, "That the people possessed only such as arose from their own work and labour, but no absolute one in the soil, of which the king appeared to be general proprietor. A man's house, furniture, or canoe, was considered as his private property, as was also the land allotted him, as long as he occupied and cultivated it; but whenever he removed with his family to another place, the ground he held reverted to the king, who gave it to whom he pleased, or to those who solicited to cultivate it."

All that part of the island which they had an opportunity of seeing is said to have been well cultivated. It was covered with trees of various kinds and sizes, many of which must have been very large, as they made canoes of their trunks, some of which were capable of carrying twenty-eight or thirty men. Among the timber trees was noticed the ebony, and a tree which when pierced or wounded, yielded a thick white liquor of the consistence of cream. "They had also a species of the manchineel tree, in cutting down of which our people frequently got blistered and swelled; the inhabitants pointed out the cause, saying it was owing to their being sprinkled by the sap. This they reckoned among the unlucky trees, and advised our people against the use of it."

But the most singular tree noticed at Pelew, was one in its size and manner of branching not unlike our cherry tree, but in its leaves resembling the myrtle. Its peculiarity was, that it had no bark, but only an outward coat of about the thickness of a card, which was darker than the inside, though equally close in texture. Its colour was nearly that of mahogany, and the wood was so extremely hard, that few of the tools which the English had could work it. They also found cabbage-trees, the wild bread-fruit, and another tree whose fruit something resembled an almond. But yams and cocoa-nuts, being their principal articles of sustenance, claimed their chief attention.

The island Cooroora, of which Pelew is the capital, likewise produced plantains, bananas, Seville oranges, and lemons, but neither of them in any considerable quantity. None of the islands which the English visited had any kind of grain. As to birds, they had plenty of common cocks and hens, which, though not domesticated, kept running about near their houses and plantations; and what appears extremely singular is, that the natives had never made any use of them, till our people told them they were excellent eating. Pigeons they accounted a great dainty; but none but those of a certain dignity were permitted to eat of them. The English left them two geese, which were the only remains of their live stock.

From

(A) This was a mark of rank worn upon the wrist, with which Captain Wilson was invested by the king; but what animal it came from our people could not learn.

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From the description of the country it appears to be very mountainous; but some of the valleys are represented as extensive and beautiful, affording many delightful prospects. The soil being very rich produces great abundance of grass, which, as there are no cattle to eat it, grows very high, and was scorched and burnt up by the sun. Our people saw no river at Pelew; their supplies of fresh water being obtained from small streams and ponds, of which there are a great many.

From this account of the scanty produce of these islands, it is evident that no luxury reigned among their inhabitants, whose principal article of food appears to be fish; they had no salt, nor did they make use of sauce or any seasoning in any thing they ate. Their drink was also as simple as their diet: it principally consisted of the milk of the cocoa nut; but upon particular occasions they used a kind of sweet drink and sherbet, which latter had the addition of some juice of orange.

The islands appeared to be populous, though to what extent could not be ascertained. Their houses were raised about three feet from the ground, upon stones which appeared as if hewn from the quarry. The interior part of them was without any division, the whole forming one great room, which rose in a ridge like our barns, the outside being thatched thick and close with bamboos or palm leaves. All their implements, utensils, weapons of war, and canoes, are much of the same kind with those which were found in the South sea islands.

In their marriages they allow a plurality of wives, though not in general more than two. When a woman is pregnant, the utmost attention is paid to her; but upon other occasions no more respect is shown to one sex than the other. "One of our people endeavouring to make himself agreeable to a lady belonging to one of the rupacks, by what we should call a marked assiduity, Arra Kooker, with the greatest civility, gave him to understand that it was not right to do so."

They have places particularly appropriated to sepulture; their graves being made nearly the same as they are in our country churchyards. The corpse is attended only by women, who at the place of interment make a great lamentation. The men, however, assemble round the body before it is carried to the grave, on which occasion they preserve a solemn silence; "their minds, from principles of fortitude or philosophy, being armed to meet the events of mortality with manly submission, divested of the external testimony of human weakness."

On the article of religion our editor observes, "That among all the race of men whom navigation has brought to our knowledge, few appear to be without a sense of something like religion, however it may be mixed with idolatry or superstition. And yet our people, during their continuance with the natives of Pelew, never saw any particular ceremonies, or observed any thing that had the appearance of public worship. But though there was not found on any of the islands they visited any place appropriated to religious rites, it would perhaps be going too far to declare that the people of Pelew had absolutely no idea of religion. Independent of external testimony, there may be such a thing as the religion of the heart, by which the mind may in awful silence be turned to contemplate the God of Nature; and though unblessed by those lights which have pointed to the Christian world an unerring path to happiness and peace, yet they might, by the light of reason only, have discovered the efficacy of virtue, and the temporal advantages arising from moral rectitude.

"Superstition is a word of great latitude, and vaguely defined: though it hath in enlightened ages been called the offspring of ignorance, yet in no time hath it existed without having some connection with religion. Now the people of Pelew had beyond all doubt some portion of it, as appeared by the wish expressed by the king when he saw the ship building, that the English would take out of it some particular wood, which he perceived they had made use of, and which he observed was deemed an ill omen, or unpropitious.

"They had also an idea of an evil spirit, that often counteracted human affairs. A very particular instance of this was seen when Mr Barker, a most valuable member in the English society, fell backwards from the side of the vessel, whilst he was on the stocks: Raa Kook, who happened to be present, observed that it was owing to the unlucky wood our people had suffered to remain in the vessel, that the evil spirit had occasioned this mischief to Mr Barker."

They likewise appeared to entertain a strong idea of divination, as was evident from the ceremonies they practised before they undertook any enterprise of moment. A few occurrences, which are mentioned in the course of the narrative, would also lead us to believe that they could not be altogether unacquainted with the nature of religious worship; for when they were present at the public prayers of the English, they expressed no surprise at what was doing, but seemed desirous to join in them, and constantly preserved the most profound silence. The general even refused to receive a message from the king which arrived during divine service. And upon another occasion, when Captain Wilson told Lee Boo, that good men would live again above, he replied, with great earnestness, "All same Pelew; bad men stay in earth; good men go into sky; become very beautiful," holding his hand up, and giving a fluttering motion to his fingers. Some later voyagers, however, have affirmed, that these people, notwithstanding their superstition, have no notion whatever of a Deity; a circumstance to which it is extremely difficult to give full credit.

The most wonderful circumstances in the history of this people, except that last mentioned, are the acuteness of their understanding, their hospitality, and the implicit confidence which they placed in utter strangers. That their manners were pleasing, and their society not disagreeable, is evident from the conduct of Madan Blanchard, one of the seamen, who, when the vessel was built and ready to take her departure with his captain and his companions, was left behind at his own particular request. That they had the fullest confidence in Captain Wilson and his crew, is put beyond a doubt by the behaviour of the king and Raa Kook when their guests were to leave them. Raa Kook solicited his brother's permission to accompany the English, but from prudential motives was refused. The sovereign, however, resolved to entrust his second son Lee Boo to Captain Wilson's care, that he might improve his mind, and learn such things as at his return would benefit his country.

The instructions which he gave the young man, and the fortitude which he showed upon this occasion,

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would have done honour to the most enlightened mind. Upon delivering him to Captain Wilson, he used these expressions: "I would wish you to inform Lee Boo of all things which he ought to know, and make him an Englishman. The subject of parting with my son I have frequently revolved; I am well aware that the distant countries he must go through, differing much from his own, may expose him to dangers, as well as diseases, that are unknown to us here, in consequence of which he may die; I have prepared my thoughts to this: I know that death is to all men inevitable; and whether my son meets this event at Pelew or elsewhere is immaterial. I am satisfied, from what I have observed of the humanity of your character, that if he is sick you will be kind to him; and should that happen, which your utmost care cannot prevent, let it not hinder you, or your brother, or your son, or any of your countrymen, returning here; I shall receive you, or any of your people, in friendship, and rejoice to see you again." How noble! This is the language of a king, a father, and a philosopher, who would have been delighted to see his son with European accomplishments. But, alas! the subsequent history of this amiable youth must force a tear from the eye of every reader whose heart is not callous to the genuine feelings of nature and humanity. As soon as they arrived at Macao, the house into which he first entered, and the different articles of furniture, fixed him in silent admiration; but what struck his imagination most was the upright walls and flat ceilings of the rooms, being utterly unable to comprehend how they could be so formed. When he was introduced to the ladies of the family, his deportment was so easy and polite, that it could be exceeded by nothing but his abundant good nature; and at his departure, his behaviour left on the mind of every one present the impression, that, however great the surprise might be which the scenes of a new world had awakened in him, it could hardly be exceeded by that which his own amiable manners and native polish would excite in others.

They were now conducted to the house of an English gentleman, who introduced them into a large hall, which was lighted up, with a table in the middle, covered for supper, and a sideboard handsomely decorated. Here a new scene burst at once upon Lee Boo's mind; he was all eye, all admiration. The vessels of glass particularly rivetted his attention; but when he surveyed himself in a large pier glass at the upper end of the hall, he was in raptures with the deception. It was in truth, to him, a scene of magic, a fairy tale.

Soon after the people of the vessel came on shore, some of them went to purchase things they were in want of; in doing which they did not forget Lee Boo, who was a favourite with them all. Among the trinkets they brought him was a string of large glass beads, the first sight of which almost threw him into an ecstacy: he hugged them with a transport which could not have been exceeded by the interested possessor of a string of oriental pearls. His imagination suggested to him that he held in his hand all the wealth the world could afford him. He ran with eagerness to Captain Wilson to show him his riches, and begged he would get him a Chinese vessel to carry them to the king his father, that he might see what the English had done for him; adding, that if the people faithfully executed their charge, he would at their return present them with one or two beads as a reward for their services.

Having no quadrupeds at Pelew, the sheep, goats, and other cattle, which he met with at Macao, were viewed with wonder; but soon after, seeing a man pass the house on horseback, he was so much astonished, that he wanted every one to go and look at the strange sight. After the matter, however, was explained to him, he was easily persuaded to get upon horseback himself; and when he was informed what a noble, docile, and useful animal it was, he besought the captain to send one to his uncle Raa Kook, as he was sure it would be of great service to him.

Omitting a number of other particulars of this kind, which excited his curiosity and showed the excellent disposition of his heart, we shall follow him to England, the country from which he was never to return. Here he had not been long before he was sent to an academy to be instructed in reading and writing, which he was extremely eager to attain, and most assiduous in learning. His temper was mild and compassionate in the highest degree; but it was at all times governed by discretion and judgment. If he saw the young asking relief, he would rebuke them with what little English he had, telling them it was a shame to beg when they were able to work; but the entreaties of old age he could never withstand, saying, "Must give poor old man, old man no able to work."

He always addressed Mr Wilson by the name of Captain, but never would call Mrs Wilson by any other name than mother, looking on that as a mark of the greatest respect; and such was the gratitude of his heart for the kindness they showed him, that if any of the family were ill, he always appeared unhappy, would creep softly up to the chamber, and sit silent by the bedside for a long time together without moving, peeping gently from time to time between the curtains, to see if they slept or lay still.

He was now proceeding with hasty strides in gaining the English language, writing, and accounts, when he was overtaken by that fatal disease, the smallpox, which the greatest pains had been taken to guard him against; and notwithstanding the utmost care and attention of his physician, he fell a victim to this scourge of the human race.

Upon this trying occasion, his spirit was above complaining, his thoughts being all engrossed by the kindness of his benefactors and friends. He told his attendant, that his father and mother would grieve very much, for they knew he was sick. This he repeated several times, "and begged him to go to Pelew, and tell Abba Thulle that Lee Boo take much drink to make smallpox go away, but he die; that the captain and mother very kind; all English very good men; much sorry he could not speak to the king the number of fine things the English had got." Then he reckoned up the presents which had been given him, desiring that they might be properly distributed among the chiefs, and requesting that particular care might be taken of two glass pedestals, which he begged might be presented to his father.

We have given this short history of Lee Boo, because it exhibits in a strong light the manners of the natives of the Pelew islands, to which we know nothing similar in the history of man from the savage state to that of civilization,

Pelew Iſlands.

civilization. They appear to have had no communication with any other people, and were yet neither treacherous, cruel, nor cowardly. They are a ſtriking inſtance of the weakneſs of all the philoſophic theories by which mankind are uſually traced from their origin through the ſeveral ſtages of ſavagiſm, barbariſm, and civilization, down to the period of refinement, ending in effeminacy.

Since the publication of Captain Wilſon's voyage we have ſome further accounts of theſe iſlands, all confirming what we were firſt told of the gentleneſs of the people. Two armed ſhips were, by order of the court of directors, fitted out at Bombay, for the purpoſe of ſurveying the iſlands of Pelew, and furniſhing the natives with domeſtic animals, and ſuch other things as might add to the comforts of life. Among the preſents to the king were ſwords and other European implements of war; of which it is at leaſt poſſible that he and his people might have been equally happy had they remained for ever in total ignorance. The foundation of a fort was likewiſe laid on one of the iſlands, and poſſeſſion of it taken in the name of the Engliſh; we truſt with no remote view of enſlaving the people, or of driving them from their native country. It has been likewiſe announced in a late publication, that Captain M'Cluer, who commanded the armed ſhips, was ſo delighted with the manners of the king and his ſubjects, that he has reſolved to paſs the remainder of his days on thoſe iſlands at the early age of 34. The following is the ſequel of the adventure here alluded to. The two veſſels called the Panther and Endeavour, under the command of Captain M'Cluer, were fitted out for a voyage to the Pelew iſlands, to acquaint Abba Thulle the king with the death of his favourite ſon Lee Boo, who went to England with Captain Wilſon in the Antelope in 1783, where he died. On the 24th of Auguſt 1790 Captain M'Cluer ſailed from Bombay, having on board Meſſrs White and Wedgeborough, who had been ſhipwrecked with Captain Wilſon, and were much eſteemed by the king of thoſe iſlands, at which he arrived in January 1791. Abba Thulle, the king, received them with demonſtrations of joy as Engliſhmen, of whom he had previouſly found reaſon to entertain a very favourable opinion. The preſents which the company ſent to Abba Thulle were landed with all convenient ſpeed. Theſe conſiſted of a conſiderable quantity of live ſtock, ſuch as cows, bulls, ewes, rams, goats, pigs, and poultry, together with arms, ammunition, and packages of hardware, compriſing a number of articles which could not fail to be of ſingular advantage to the natives. The grateful king was aſtoniſhed at the meaning of all this, and being informed that it was a ſmall acknowledgement for his generous treatment of the crew of the Antelope when wrecked on his coaſt, he expreſſed his regret that it was not in his power to have done more.

With the nature and ſituation of theſe iſlands, as well as the amiable and engaging manners of the natives, Captain M'Cluer was ſo well pleaſed, that he conſidered them as a paradiſe, where he could ſpend with pleaſure the remainder of his days. Soon after theſe tranſactions the Panther ſailed in the month of February from the Pelew iſlands for China, the Endeavour remaining behind till her return, which happened on the 10th of June the ſame year. Having viſited theſe iſlands a third time, after a ſurvey of the coaſt of New Guinea, he ſignified to the officers of the Panther his intention of reſigning the command of the expedition, and remaining on the iſlands. To render his new ſituation as comfortable as poſſible, he requeſted from Mr Wedgeborough about 20 muſkets with bayonets, 12 piſtols, 12 pole-axes, 2 wall-pieces, fuſee and piſtol ammunition, an anvil, bellows, frame-ſaw, ſtanding vice, &c. After a conſultation with the other officers, it was agreed on to ſend him theſe articles, on condition that they ſhould be accounted for by his attorneys, if the Eaſt India Company ſhould not be ſatisfied with the meaſure. This reſolution was carried into effect in the month of February 1793.

Pelew Iſlands, Pelias.

Scarcely, however, had he been 15 months in his new ſettlement till he became impatient to abandon it, and he ſoon after ſet ſail for Macao. He returned to the Pelew iſlands in the year 1795, for the purpoſe of removing his family; and ſailing from thence to Bombay, he touched at Bencoolen, where he met with a frigate bound for Bombay, into which he put a part of his family with ſix Pelew women, ſailing himſelf with the other natives towards Bengal, from which laſt place he ſet ſail ſome time after; but neither he nor any of his crew have been ſince heard of.

PELIAS, in fabulous hiſtory, twin-brother of Neleus, was ſon of Neptune by Tyro, daughter of Salmoneus. His birth was concealed by his mother, who wiſhed her father to be ignorant of her incontinence. He was expoſed in the woods, but his life was preſerved by ſhepherds; and he received the name of *Pelias*, from a ſpot of the colour of *lead* in his face. Some time after Tyro married Cretheus, ſon of Æolus, king of Iolchos, and became mother of three children, of whom Æſon was the eldeſt. Pelias viſited his mother, and was received in her family; and after the death of Cretheus, he unjuſtly ſeized the kingdom, which belonged not to him, but to the children of Tyro by the deceaſed king. To ſtrengthen himſelf in his uſurpation, Pelias conſulted the oracle; and when he was told to beware of one of the deſcendants of Æolus, who ſhould come to his court with one foot ſhod and the other bare, he privately removed the ſon of Æſon, after he had openly declared that he was dead. Theſe precautions proved vain. Jaſon, the ſon of Æſon, who had been educated by Chiron, returned to Iolchos, when come to years of maturity; and having loſt one of his ſhoes in croſſing the river Anaurus or the Evenus, Pelias immediately perceived that this was the perſon whom he had ſo much dreaded. His unpopularity prevented him from acting with violence to a ſtranger, whoſe uncommon dreſs and commanding aſpect had raiſed admiration in the people. But his aſtoniſhment was greatly excited, when he ſaw Jaſon arrive at his palace, with his friends and his relations, and boldly demand the kingdom which he had uſurped. Pelias, conſcious that his complaints were well founded, endeavoured to divert his attention, and told him that he would voluntarily reſign the crown to him, if he went to Colchis to avenge the death of Phryxus, the ſon of Athamas, whom Æeres had cruelly murdered. He further declared, that the expedition would be attended with the greateſt glory, and that nothing but the infirmities of old age had prevented himſelf from vindicating the honour of his country, and the injuries of his family, by puniſhing the aſſaſſin. This ſo warm-

ly recommended, was with equal warmth accepted by the young hero, and his intended expedition was made known all over Greece. While Jason was absent in the Argonautic expedition, Pelias murdered Æson and all his family; but, according to the more received opinion of Ovid, Æson was still living when the Argonauts returned, and he was restored to the flower of youth by the magic of Medea. This change in the vigour and the constitution of Æson astonished all the inhabitants of Iolchos; and the daughters of Pelias, who have received the patronymic of Peliades, expressed their desire to see their father's infirmities vanish by the same powerful magic. Medea, who wished to avenge the injuries which her husband Jason had received from Pelias, raised the desires of the Peliades, by cutting an old ram to pieces, and boiling the flesh in a cauldron, and then turning it into a fine young lamb. After they had seen this successful experiment, the Peliades cut their father's body to pieces, after they had drawn all the blood from his veins, on the assurance that Medea would replenish them by her wonderful power. The limbs were immediately put into a cauldron of boiling water; but Medea suffered the flesh to be totally consumed, and refused to give the promised assistance, and the bones of Pelias did not even receive a burial. The Peliades were four in number, Alceste, Pisidice, Pelopea, and Hippothoe, to whom Hyginus adds Medusa. Their mother's name was Anaxibia, the daughter of Bias or Philomache, the daughter of Amphion. After this parricide, the Peliades fled to the court of Admetus, where Acastus, the son-in-law of Pelias, pursued them, and took their protector prisoner. The Peliades died, and were buried in Arcadia.

PELICAN, a genus of birds belonging to the order of anseres. See ORNITHOLOGY *Index*.

PELICAN, in *Chemistry*, is a glass alembic consisting of one piece, with a tubulated capital, from which two opposite and crooked beaks pass out, and enter again at the bottom of the cucurbit. This vessel was contrived by the older chemists for a continued distillation, but has gone into disuse.

PELICANUS, a genus of birds belonging to the order of anseres. See ORNITHOLOGY *Index*.

PELION (Diodorus Siculus, &c.), *Pelios*, *mons* understood, (Mela, Virgil, Horace, Seneca), a mountain of Thessaly near Ossa, and hanging over the Sinus Pelasgicus or Pegasicus; its top covered with pines, the sides with oaks, (Ovid). Said also to abound in wild ash, (Val. Flaccus). From this mountain was cut the spear of Achilles, called *pelias*, which none but himself could wield, (Homer). Dicearchus, Aristotle's scholar, found this mountain 1250 paces higher than any other of Thessaly, (Pliny). *Pelius*, Cicero; *Peliacus*, (Catullus), the epithet.

PELLA, in *Ancient Geography*, a town situated on the confines of Emathia, a district of Macedonia, (Ptolemy); and therefore Herodotus allots it to Bottiæa, a maritime district on the Sinus Thermaïcus. It was the royal residence, situated on an eminence, verging to the south-west, encompassed with unpassable marshes summer and winter: in which, next the town, a citadel like an island rises, placed on a bank or dam, a prodigious work, both supporting the wall and securing it from any hurt by means of the circumfluent water. At a distance, it seems close to the town, but is separated from it by the Ludias, running by the walls, and joined to it by a bridge, (Livy): distant from the sea 120 stadia, the Ludias being so far navigable, (Strabo). Mela calls the town *Pelle*, though most Greek authors write *Pella*. The birth-place of Philip, who enlarged it; and afterwards of Alexander, (Strabo, Mela). Continued to be the royal residence down to Perses, (Livy). Called *Pella Colonia*, (Pliny); *Colonia Julia Augusta*, (Coin). It afterwards came to decline, with but few and mean inhabitants, (Lucian). It is now called Τα Παλάτια, the *Little Palace*, (Holstenius). *Pellæus*, both the gentilitious name and the epithet, (Lucian, Juvenal, Martial.)—Another PELLA, (Polybius, Pliny); a town of the Decapolis, on the other side the Jordan; abounding in water, like its cognominal town in Macedonia; built by the Macedonians, (Strabo); by Seleucus, (Eusebius); anciently called *Butis*, (Stephanus); *Apamea*, (Strabo); situated 35 miles to the north-east of Gerasa, (Ptolemy). Thither the Christians, just before the siege of Jerusalem by Titus, were divinely admonished to fly, (Eusebius). It was the utmost boundary of the Peræa, or Transjordan country, to the north, (Josephus).

PELLETIER, BERTRAND, a celebrated chemical philosopher, was born at Bayonne in 1761, and very soon discovered a strong predilection for the sciences, to cherish which he had every thing in his father's house that could be reasonably desired, and here he acquired the elements of that art for which he was afterwards so famous. His subsequent progress he made under Darcet, who admitted him among the pupils attached to the chemical laboratory of France. Five years intense application under such a master, gave him a stock of knowledge very uncommon at his years. As a convincing proof of this, he published, when only 21, a number of valuable observations on arsenic acid, proving, contrary to the opinion of Macquer, that sulphuric acid distilled from the arseniate of potash, disengages the acid of arsenic.

Encouraged by the success which attended his first labours of a chemical nature, he communicated his remarks on the crystallization of sulphur, cinnabar, and the deliquescent salts; the examination of zeolites, particularly the false zeolite of Freyburg, which he discovered to be merely an ore of zinc. He also made observations on the oxygenated muriatic acid, in reference to the absorption of oxygen; on the formation of others, chiefly the muriatic and the acetous; and a number of memoirs on the operation of phosphorus made in the large way; its conversion into phosphoric acid, and its combination with sulphur and most metallic substances.

It was by his operations on phosphorus that he burnt himself so severely as nearly to endanger his life. Immediately on his recovery he began the analysis of different varieties of plumbago from France, England, Germany, Spain, and America, and gave both novelty and interest to his work, even after the labours of Scheele on the same subject had made their appearance. The analysis of carbonate of barytes led him to make experiments on animals, from which he discovered that this earth is a real poison, in whatever way administered. Strontites was also analysed by this celebrated chemist, which was found to contain a new earth.

Pelletier discovered a process for preparing verditer in the large way, equal, it is said, in beauty to that which

which is manufactured in England. He was also among the first who shewed the possibility of refining bell metal, and separating the tin. His first experiments were performed at Paris, after which he went to the foundery at Romilly, to prove their accuracy in the large way. He was soon after this admitted a member of the Academy of Sciences at Paris, and afterwards accompanied Borda and General Daboville to La Fere, to assist in experiments on a new species of gunpowder. Being obliged to pass great part of the day in the open air during a cold and moist season, in order to render his experiments more decisive, his health, which was naturally delicate, was very much impaired. He partly recovered it, but again fell a victim to his thirst after knowledge. for he was at one time nearly destroyed by inspiring the oxygenated muriatic acid gas, which occasioned a convulsive asthma, which at times appeared to abate, but was found to be incurable. The assistance of art was insufficient to save him, and he died at Paris on the 21st of July 1797, of a pulmonary consumption, in the flower of his age, being only 36.

PELLETS, in *Heraldry*, those roundles that are black; called also *ogresses* and *gunstones*, and by the French *torteaux de sable*.

PELLICLE, among physicians, denotes a thin film or fragment of a membrane. Among chemists it signifies a thin surface of crystals uniformly spread over a saline liquor evaporated to a certain degree.

PELLISON, or Pellison Fontanier, Paul, one of the finest geniuses of the 17th century, was the son of James Pellison counsellor at Castres. He was born at Beziers in 1624, and educated in the Protestant religion. He studied with success the Latin, Greek, French, Spanish, and Italian tongues, and applied himself to the reading the best authors in these languages; after which he studied the law at Castres with reputation. In 1652 he purchased the post of secretary to the king, and five years after became first deputy to M. Fouquet. He suffered by the disgrace of that minister; and in 1661 was confined in the Bastile, from whence he was not discharged till four years after. During his confinement he applied himself to the study of controversy; and in 1670 abjured the Protestant religion. Louis XIV. bestowed upon him an annual pension of 2000 crowns; and he likewise enjoyed several posts. In 1676 he had the abbey of Giment, and some years after the priory of St Orens at Auch. He died in 1693. His principal works are, 1. The History of the French Academy. 2. Reflections on religious Disputes, &c. in 4 vols. 12mo. 3. The History of Louis XIV. 4. Historical Letters and Miscellanies, in 3 vols. 12mo.

PELOPIA, a festival observed by the Eleans in honour of Pelops. A ram was sacrificed on the occasion, which both priests and people were prohibited from partaking of, on pain of excommunication from Jupiter's temple: the neck only was allotted to the officer who provided wood for the sacrifice. This officer was called Ξυλευς; and white poplar was the only wood made use of at this solemnity.

PELOPONNESUS, (Dionysius), a large peninsula to the south of the rest of Greece; called, as it were *Pelopis nesus*, or *insula*, though properly not an island, but a peninsula; yet wanting but little to be one, viz. the isthmus of Corinth, ending in a point like the leaf of the platane or plane tree. Anciently called *Apia* and *Pelasgia*; a peninsula second to no other country for nobleness; situated between two seas, the Egean and Ionian, and resembling a platane-leaf, on account of its angular recesses or bays, (Pliny, Strabo, Mela). Strabo adds from Homer, that one of its ancient names was *Argos*, with the epithet *Achaicum*, to distinguish it from Thessaly, called *Pelasgicum*. Divided into six parts; namely, Argolis, Laconica, Messenia, Elis, Achaia, and Arcadia, (Mela). Now called the *Morea*.

PELOPS, in fabulous history, the son of Tantalus king of Phrygia, went into Elis, where he married Hippodamia the daughter of Oenomaus king of that country; and became so powerful, that all the territory which lies beyond the isthmus, and composes a considerable part of Greece, was called *Peloponnesus*, that is, the *island of Pelops*, from his name and the word Νησος.

PELTA, a small, light, manageable buckler, used by the ancients. It was worn by the Amazons. The pelta is said by some to have resembled an ivy leaf in form; by others it is compared to the leaf of an Indian fig-tree; and by Serbius to the moon in her first quarter.

PELTARIA, a genus of plants belonging to the tetradynamia class, and in the natural method ranked under the 39th order, *Siliquosæ*. See Botany *Index*.

PELUSIUM, in *Ancient Geography*, a strong city of Egypt, without the Delta, distant 20 stadia from the sea; situated amidst marshes; and hence its name and its strength. Called the *key* or *inlet of Egypt* (Diodorus, Hirtius); which being taken, the rest of Egypt lay quite open and exposed to an enemy. Called *Sin* (Ezekiel). *Pelusiacus* the epithet (Virgil, Diodorus). From its ruins arose Damietta. E. Long. 32°, N. Lat. 31°.

Mr Savary gives us the following account of this place: "The period of its foundation, as well as that *Letters on Egypt.* of the other ancient cities of Egypt, is lost in the obscurity of time. It flourished long before Herodotus. As it commanded the entrance of the country on the side of Asia, the Pharaohs rendered it a considerable fortress: one of them raised a rampart of 30 leagues in length from the walls of this town to Heliopolis. But we find from the history of nations that the long wall of China, those which the weakness of the Greek emperors led them to build round Constantinople, and many others, built at an immense expence, were but feeble barriers against a warlike people: these examples have taught us, that a state, to be in security against a foreign yoke, must form warriors within itself, and that men must be opposed to men. This rampart which covered Pelusium, did not stop Cambyses, who attacked it with a formidable army. The feeble character of the son of Amasis, unable to prevent the desertion of 200,000 Egyptians, who went to found a colony beyond the cataracts, had not force sufficient to oppose that torrent which broke in upon his country. Cambyses, after a bloody battle, wherein he cut his enemies to pieces, entered Pelusium in triumph. That memorable day, which saw the desertion of one part of the Egyptian militia and the ruin of the other, is the true epoch of the subjugation of that rich country. Since, that period, it has passed under the yoke of the Persians, the Macedonians, the Romans, the Greeks, the Arabs, and the Turks. A

Peluſium ‖ Pembroke. continued ſlavery of more than 2000 years ſeems to ſecure them an eternal bondage.

"Herodotus, who viſited Peluſium ſome years after the conqueſt of Cambyſes, relates an anecdote which I cannot omit: 'I ſurveyed (ſays he) the plain where the two armies had fought. It was covered with human bones collected in heaps. Thoſe of the Perſians were on one ſide, thoſe of the Egyptians on the other, the inhabitants of the country having taken care to ſeparate them after the battle. They made me take notice of a fact which would have appeared very aſtoniſhing to me without their explanation of it. The ſkulls of the Perſians, which were ſlight and fragile, broke on being lightly ſtruck with a ſtone; thoſe of the Egyptians, thicker and more compact, reſiſted the blows of flint. This difference of ſolidity they attributed to the cuſtom the Perſians have of covering their heads from their infancy with the tiara, and to the Egyptian cuſtom of leaving the heads of their children bare and ſhaved, expoſed to the heat of the ſun. This explanation appeared ſatisfactory to me.' Mr Savary aſſures us that the ſame cuſtoms ſtill ſubſiſt in Egypt, of which he frequently had ocular demonſtration.

"Peluſium (continues he), after paſſing under the dominion of Perſia, was taken by Alexander. The brave Antony, general of cavalry under Gabinius, took it from his ſucceſſors, and Rome reſtored it to Ptolemy Auletes. Pompey, whoſe credit had eſtabliſhed this young prince on the throne of Egypt, after the fatal battle of Pharſalia took refuge at Peluſium. He landed at the entrance of the harbour; and, on quitting his wife Cornelia and his ſon, he repeated the two following verſes of Sophocles, 'The free man who ſeeks an aſylum at the court of a king will meet with ſlavery and chains.' He there found death. Scarcely had he landed on the ſhore, when Theodore the rhetorician, of the iſle of Chio, Septimius the courtier, and Achillas the eunuch, who commanded his troops, wiſhing for a victim to preſent to his conqueror, ſtabbed him with their ſwords. At the fight of the aſſaſſins Pompey covered his face with his mantle, and died like a Roman. They cut off his head, and embalmed it, to offer it to Cæſar, and left his body naked on the ſhore. It was thus that this great man, whoſe warlike talents had procured the liberty of the ſeas for the Romans, and added whole kingdoms to their extended empire, was baſely ſlain in ſetting foot on the territory of a king who owed to him his crown. Philip his freedman, collecting together, under favour of the night, the wreck of a boat, and ſtripping off his own cloak to cover the ſad remains of his maſter, burnt them according to the cuſtom. An old ſoldier, who had ſerved under Pompey's colours, came to mingle his tears with thoſe of Philip, and to aſſiſt him in performing the laſt offices to the manes of his general.—Peluſium was often taken and pillaged during the wars of the Romans, the Greeks, and the Arabs. But in ſpite of ſo many diſaſters, ſhe preſerved to the time of the Cruſades her riches and her commerce. The Chriſtian princes having taken it by ſtorm, ſacked it. It never again roſe from its ruins; and the inhabitants went to Damietta." See Damietta.

PELVIS, in *Anatomy*. See Anatomy *Index*.

PEMBROKE, Mary, Countess of. See Herbert.

Pembroke, in Pembrokeſhire, in England, is the principal town in the county. It is ſituated upon a creek of Milford-Haven, and in the moſt pleaſant part of Wales, being about 256 miles diſtant from London. It is the county-town, and has two handſome bridges over two ſmall rivers which run into a creek, forming the weſt ſide of a promontory. It is well inhabited, has ſeveral good houſes, and but one church. There is alſo a cuſtomhouſe in it. There are ſeveral merchants in it, who, favoured by its ſituation, employ near 200 ſail on their own account; ſo that, next to Caermarthen, it is the largeſt and richeſt town in South Wales. It has one long ſtraight ſtreet, upon a narrow part of a rock; and the two rivers ſeem to be two arms of Milford-Haven, which ebbs and flows cloſe up to the town. It was in former times fortified with walls, and a magnificent caſtle ſeated on a rock at the weſt end of the town. In this rock, under the chapel, is a natural cavern called *Wogan*, remarked for having a very fine echo: this is ſuppoſed to have been a ſtore-room for the garriſon, as there is a ſtaircaſe leading into it from the caſtle. This ſtructure being burnt a few years after it was erected, it was rebuilt. It is remarkable for being the birth-place of Henry VII. and for the brave defence made by the garriſon for Charles I. The inhabitants amount to 1842.

Pembroke, Pembrokeſhire. PEMBROKESHIRE, a county of Wales, bounded on all ſides by the Iriſh ſea, except on the eaſt, where it joins to Caermarthenſhire, and on the north-eaſt to Cardiganſhire. It lies the neareſt to Ireland of any county in Wales; and extends in length from north to ſouth 35 miles, and from eaſt to weſt 29, and is about 140 in circumference. It is divided into ſeven hundreds; contains about 420,000 acres, one city, eight market-towns, two foreſts, 145 pariſhes, about 11,800 houſes, and in 1801 about 56,000 inhabitants. It lies in the province of Canterbury, and dioceſe of St David's. It ſends three members to parliament, viz. one for the ſhire, one for Haverfordweſt, and one for the town of Pembroke.

The air of Pembrokeſhire, conſidering its ſituation, is good; but it is in general better the farther from the ſea. As there are but few mountains, the ſoil is generally fruitful, eſpecially on the ſea-coaſts; nor are its mountains altogether unprofitable, but produce paſture ſufficient to maintain great numbers of ſheep and goats. Its other commodities are corn, cattle, pit-coal, marl, fiſh, and fowl. Among theſe laſt are falcons, called here *peregrines*. Amongſt the birds common here are migratory ſea-birds, that breed in the iſle of Ramſey, and the adjoining rocks called *The Biſhop and his Clerks*. About the beginning of April ſuch flocks of ſea-birds, of ſeveral kinds, reſort to theſe rocks, as appear incredible to thoſe who have not ſeen them.

The inhabitants of this county make a very pleaſant durable fire of culm, which is the duſt of coal made up into balls with a third part of mud. The county is well watered by the rivers Clethy, Dougledy, Cledhew, and Teive; which laſt parts it from Cardiganſhire. There is a diviſion of the county ſtyled *Rhos* in the Welch, by which is meant a large green plain. This is inhabited by the deſcendants of the Flemings, placed there by Henry I. to curb the Welch, who were never able to expel them, though they often attempted it. On the coaſts of this county, as well as on thoſe of Glamorganſhire and the Severn ſea, is found a kind of alga or laver, which is gathered in ſpring; and of which the

Pembroke-shire, Pen. the inhabitants make a sort of food, called in Welch *lhavan*, and in English *black butter*. Having washed it clean, they lay it to sweat between two flat stones, then shred it small, and knead it well, like dough for bread, and then make it up into great balls or rolls, which is by some eaten raw, and by others fryed with oatmeal and butter. It is accounted excellent against many distempers.

PEN, a town of Somersetshire, in England, on the north-east side of Wincaunton, where Kenwald a West Saxon king so totally defeated the Britons, that they were never after able to make head against the Saxons; and where, many ages after this, Edmund Ironside gained a memorable victory over the Danes, who had before, i. e. in 1001, defeated the Saxons in that same place.

PEN, a little instrument, usually formed of a quill, serving to write withal.

Pens are also sometimes made of silver, brass, or iron.

Dutch PENS, are made of quills that have passed through hot ashes, to take off the grosser fat and moisture, and render them more transparent.

Fountain PEN, is a pen of silver, brass, &c. contrived to contain a considerable quantity of ink, and let it flow out by gentle degrees, so as to supply the writer a long time without being under the necessity of taking fresh ink.

Plate CCCCVII. fig. 1. The fountain pen is composed of several pieces. The middle piece, fig. 1. carries the pen, which is screwed into the inside of a little pipe, which again is soldered to another pipe of the same bigness as the lid, fig. 2.; in which lid is soldered a male screw, for screwing on the cover, as also for stopping a little hole at the place and hindering the ink from passing through it. At the other end of the piece, fig. 1. is a little pipe, on the outside of which the top cover, fig. 3. may be screwed. In the cover there goes a port-crayon, which is to be screwed into the last-mentioned pipe, in order to stop the end of the pipe, into which the ink is to be poured by a funnel. To use the pen, the cover fig. 2. must be taken off, and the pen a little shaken, to make the ink run more freely.

There are, it is well known, some instruments used by practical mathematicians, which are called *pens*, and which are distinguished according to the use to which they are principally applied; as for example, the drawing-pen, &c. an instrument too common to require a particular description in this place. But it may be proper to take some notice of the geometric pen, as it is not so well known, nor the principles on which it depends so obvious.

The *geometric PEN* is an instrument in which, by a circular motion, a right line, a circle, an ellipse, and other mathematical figures, may be described. It was first invented and explained by John Baptist Suardi, in a work intitled *Nuovo Instromenti per la Descrizzione di diverse Curve Antichi e Moderne*, &c. Several writers had observed the curves arising from the compound motion of two circles, one moving round the other; but Suardi first realized the principle, and first reduced it to practice. It has been lately introduced with success into the steam-engine by Watt and Bolton. The number of curves this instrument can describe is truly amazing; the author enumerates not less than 1273, which (he says) can be described by it in the simple form. We shall give a short description of it from Adam's Geometrical and Graphical Essays. Pen, Penance.

Plate CCCCVII. fig. 1. Fig. 1. represents the geometric pen; A, B, C, the stand by which it is supported; the legs A, B, C, are contrived to fold one within the other for the convenience of packing. A strong axis D is fitted to the top of the frame; to the lower part of this axis any of the wheels (as *i*) may be adapted; when screwed to it they are immoveable. EG is an arm contrived to turn round upon the main axis D; two sliding boxes are fitted to this arm; to these boxes any of the wheels belonging to the geometric pen may be fixed, and then slid so that the wheels may take into each other and the immoveable wheel *i*; it is evident, that by making the arm EG revolve round the axis D, these wheels will be made to revolve also, and that the number of their revolutions will depend on the proportion between the teeth. F*g* is an arm carrying the pencil; this arm slides backwards and forwards in the box *c d*, in order that the distance of the pencil from the centre of the wheel *h* may be easily varied; the box *c d* is fitted to the axis of the wheel *h*, and turns round with it, carrying the arm *f g* along with it: it is evident, therefore, that the revolutions will be fewer or greater in proportion to the difference between the numbers of the teeth in the wheels *h* and *i*; this bar and socket are easily removed for changing the wheels. When two wheels only are used, the bar *f g* moves in the same direction with the bar EG; but if another wheel is introduced between them, they move in contrary directions.

"The number of teeth in the wheels, and consequently the relative velocity of the epicycle or arm *f g*, may be varied *in infinitum*. The numbers we have used are 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96.

"The construction and application of this instrument is so evident from the figure, that nothing more need be pointed out than the combinations by which various figures may be produced. We shall take two as examples:

"The radius of EG (fig. 2.) must be to that of *f g* as 10 to 5 nearly; their velocities, or the number of teeth in the wheels, to be equal; the motion to be in the same direction. Fig. 2.

"If the length of *f g* be varied, the looped figure delineated at fig. 3. will be produced. A circle may be described by equal wheels, and any radius but the bars must move in contrary directions. Fig. 3.

"*To describe by this circular motion a straight line and an ellipsis.* For a straight line, equal radii, the velocity as 1 to 2, the motion in a contrary direction; the same data will give a variety of ellipses, only the radii must be unequal; the ellipses may be described in any direction." See fig. 4. Fig. 4.

PEN, or *Penstock*. See PENSTOCK.

Sea-PEN. See PENNATULA, HELMINTHOLOGY *Index*.

PENANCE, a punishment, either voluntary or imposed by authority, for the faults a person has committed. Penance is one of the seven sacraments of the Romish church. Besides fasting, alms, abstinence, and the like, which are the general conditions of penance, there are others of a more particular kind; as the repeating a certain number of ave-marys, pater-nosters,

and

Penance ‖ Pencil.

and credos, wearing a hair-ſhirt, and giving one's ſelf a certain number of ſtripes. In Italy and Spain it is uſual to ſee Chriſtians almoſt naked, loaded with chains and a croſs, and laſhing themſelves at every ſtep.

PENATES, in Roman antiquity, a kind of tutelar deities, either of countries or particular houſes; in which laſt ſenſe they differed in nothing from the lares. See LARES.

The penates were properly the tutelar gods of the Trojans, and were only adopted by the Romans, who gave them the title of *penates*.

PENCIL, an inſtrument uſed by painters for laying on their colours. Pencils are of various kinds, and made of various materials; the largeſt ſorts are made of boars briſtles, the thick ends of which are bound to a ſtick, bigger or leſs according to the uſes they are deſigned for; theſe, when large, are called *bruſhes*. The finer ſorts of pencils are made of camels, badgers, and ſquirrels hair, and of the down of ſwans; theſe are tied at the upper end with a piece of ſtrong thread, and encloſed in the barrel of a quill.

All good pencils, on being drawn between the lips, come to a fine point.

PENCIL, is alſo an inſtrument uſed in drawing, writing, &c. made of long pieces of black lead or red chalk, placed in a groove cut in a ſlip of cedar; on which other pieces of cedar being glued, the whole is planed round, and one of the ends being cut to a point, it is fit for uſe.

Black lead in fine powder, ſtirred into melted ſulphur, unites with it ſo uniformly, and in ſuch quantity, in virtue perhaps of its abounding with ſulphur, that though the compound remains fluid enough to be poured into moulds, it looks nearly like the coarſer ſorts of black lead itſelf. Probably the way which Prince Rupert is ſaid to have had, mentioned in the third volume of Dr Birch's Hiſtory of the Royal Society, of making black lead run like a metal in a mould, ſo as to ſerve for black lead again, conſiſted in mixing with it ſulphur or ſulphureous bodies.

On this principle the German black lead pencils are ſaid to be made; and many of thoſe which are hawked about by certain perſons among us are prepared in the ſame manner: their melting or ſoftening, when held to a candle, or applied to a red-hot iron, and yielding a bluiſh flame, with a ſtrong ſmell like that of burning brimſtone, betrays their compoſition; for black lead itſelf yields no ſmell or fume, and ſuffers no apparent alteration in that heat. Pencils made with ſuch additions are of a very bad kind; they are hard, brittle, and do not caſt or make a mark freely either on paper or wood, rather cutting or ſcratching them than leaving a coloured ſtroke.

The true Engliſh pencils (which Vogel in his mineral ſyſtem, and ſome other foreign writers, imagine to be prepared alſo by melting the black lead with ſome additional ſubſtances, and caſting it into a mould) are formed of black lead alone ſawed into ſlips, which are fitted into a groove made in a piece of wood, and another ſlip of wood glued over them: the ſofteſt wood, as cedar, is made choice of, that the pencil may be the eaſier cut; and a part at one end, too ſhort to be conveniently uſed after the reſt has been worn and cut away, is left unfilled with the black lead, that there may be no waſte of ſo valuable a commodity. Theſe pencils are greatly preferable to the others, though ſeldom ſo perfect as could be wiſhed, being accompanied with ſome degree of the ſame inconveniences, and being very unequal in their quality, on account of different ſorts of the mineral being fraudulently joined together in one pencil, the fore part being commonly pretty good, and the reſt of an inferior kind. Some, to avoid theſe imperfections, take the finer pieces of black lead itſelf, which they ſaw into ſlips, and fix for uſe in port crayons: this is doubtleſs the ſureſt way of obtaining black lead crayons, whoſe goodneſs can be depended on.

Pencil ‖ Pendulum.

PENDANT, an ornament hanging at the ear, frequently compoſed of diamonds, pearls, and other jewels.

PENDANTS, in *Heraldry*, parts hanging down from the label, to the number of three, four, five, or ſix at moſt, reſembling the drops in the Doric frieze. When they are more than three, they muſt be ſpecified in blazoning.

PENDANTS of a Ship, are thoſe ſtreamers, or long colours, which are ſplit and divided into two parts, ending in points, and hung at the head of maſts, or at the yard arm ends.

PENDENE-Vow, in Cornwall, in England, on the north coaſt, by Morvath. There is here an unfathomable cave under the earth, into which the ſea flows at high water. The cliffs between this and St Ives ſhine as if they had ſtore of copper, of which indeed there is abundance within land.

PENDENNIS, in Cornwall, at the mouth of Falmouth haven, is a peninſula of a mile and a half in compaſs. On this Henry VIII. erected a caſtle, oppoſite to that of St Maw's, which he likewiſe built. It was fortified by Queen Elizabeth, and ſerved then for the governor's houſe. It is one of the largeſt caſtles in Britain, and is built on a high rock. It is ſtronger by land than St Maw's, being regularly fortified, and having good outworks.

PENDULOUS, a term applied to any thing that bends or hangs downwards.

PENDULUM, a vibrating body ſuſpended from a fixed point. For the hiſtory of this invention, ſee the article CLOCK.

The theory of the pendulum depends on that of the inclined plane. Hence, in order to underſtand the nature of the pendulum, it will be neceſſary to premiſe ſome of the properties of this plane; referring, however, to *Inclined PLANE*, and to the article MECHANICS, for the demonſtration.

I. Let AC (fig. 1.) be an inclined plane, AB its perpendicular height, and D any heavy body: then the force which impels the body D to deſcend along the inclined plane AC, is to the abſolute force of gravity as the height of the plane AB is to its length AC; and the motion of the body will be uniformly accelerated. Plate CCCVIII. fig. 1.

II. The velocity acquired in any given time by a body deſcending on an inclined plane AC, is to the velocity acquired in the ſame time by a body falling freely and perpendicularly, as the height of the plane AB to its length AC. The final velocities will be the ſame; the ſpaces deſcribed will be in the ſame ratio; and the times of deſcription are as the ſpaces deſcribed.

III. If a body deſcend along ſeveral contiguous planes,

planes, AB, BC, CD, (fig. 2.) the final velocity, namely, that at the point D, will be equal to the final velocity in deſcending through the perpendicular AE, the perpendicular heights being equal. Hence, if theſe planes be ſuppoſed indefinitely ſhort and numerous, they may be conceived to form a curve, and therefore the final velocity acquired by a body in deſcending through any curve AF, will be equal to the final velocity acquired in deſcending through the planes AB, BC, CD, or to that in deſcending through AE, the perpendicular heights being equal.

IV. If from the upper or lower extremity of the vertical diameter of a circle a cord be drawn, the time of deſcent along this cord will be equal to the time of deſcent through the vertical diameter; and therefore the times of deſcent through all cords in the ſame circle, drawn from the extremity of the vertical diameter, will be equal.

V. The times of deſcent of two bodies through two planes equally elevated will be in the ſubduplicate ratio of the lengths of the planes. If, inſtead of one plane, each be compoſed of ſeveral contiguous planes ſimilarly placed, the times of deſcent along theſe planes will be in the ſame ratio. Hence, alſo, the times of deſcribing ſimilar arches of circles ſimilarly placed will be in the ſubduplicate ratio of the lengths of the arches.

VI. The ſame things hold good with regard to bodies projected upward, whether they aſcend upon inclined planes or along the arches of circles.

The point or axis of ſuſpenſion of a pendulum is that point about which it performs its vibrations, or from which it is ſuſpended.

The centre of oſcillation is a point in which, if all the matter in a pendulum were collected, any force applied at this centre would generate the ſame angular velocity in a given time as the ſame force when applied at the centre of gravity.

The length of a pendulum is equal to the diſtance between the axis of ſuſpenſion and centre of oſcillation.

Fig. 3. Let PN (fig. 3.) repreſent a pendulum ſuſpended from the point P; if the lower part N of the pendulum be raiſed to A, and let fall, it will by its own gravity deſcend through the circular arch AN, and will have acquired the ſame velocity at the point N that a body would acquire in falling perpendicularly from C to F, and will endeavour to go off with that velocity in the tangent ND; but being prevented by the rod or cord, will move through the arch NB to B, where, loſing all its velocity, it will by its gravity deſcend through the arch BN, and, having acquired the ſame velocity as before, will aſcend to A. In this manner it will continue its motion forward and backward along the arch ANB, which is called an *oſcillatory* or *vibratory* motion; and each ſwing is called a *vibration*.

Prop. I. If a pendulum vibrates in very ſmall circular arches, the times of vibration may be conſidered as equal, whatever be the proportion of the arches.

Fig. 4. Let PN (fig. 4.) be a pendulum; the time of deſcribing the arch AB will be equal to the time of deſcribing CD; theſe arches being ſuppoſed very ſmall.

Join AN, CN; then ſince the times of deſcent along all cords in the ſame circles, drawn from one extremity of the vertical diameter, are equal; therefore the cords AN, CN, and conſequently their doubles, will be deſcribed in the ſame time; but the arches AN, CN being ſuppoſed very ſmall, will therefore be nearly equal to their cords: hence the times of vibrations in theſe arches will be nearly equal.

Prop. II. Pendulums which are of the ſame length vibrate in the ſame time, whatever be the proportion of their weights.

This follows from the property of gravity, which is always proportional to the quantity of matter, or to its inertia. When the vibrations of pendulums are compared, it is always underſtood that the pendulums deſcribe either ſimilar finite arcs, or arcs of evaneſcent magnitude, unleſs the contrary is mentioned.

Prop. III. If a pendulum vibrates in the ſmall arc of a circle, the time of one vibration is to the time of a body's falling perpendicularly through half the length of the pendulum, as the circumference of a circle is to its diameter.

Let PE (fig. 5.) be the pendulum which deſcribes the arch ANC in the time of one vibration; let PN be perpendicular to the horizon, and draw the cords AC, AN; take the arc E e infinitely ſmall, and draw EFG, efg perpendicular to PN, or parallel to AC; deſcribe the ſemicircle BGN, and draw er, gs perpendicular to EG: now let t= time of deſcending through the diameter 2PN, or through the cord AN: Then the velocities gained by falling through 2PN, and by the pendulum's deſcending through the arch AE, will be as $\sqrt{2PN}$ and $\sqrt{BF}$; and the ſpace deſcribed in the time t, after the fall through 2PN, is 4PN. But the times are as the ſpaces divided by the velocities. Fig. 5.

Therefore $\frac{4PN}{\sqrt{2PN}}$ or $2\sqrt{2PN} : t :: \frac{Ee}{\sqrt{BF}}$: time of deſcribing $Ee = \frac{t \times Ee}{2\sqrt{2PN \times BF}}$. But in the ſimilar triangles PEF, Eer, and KGF, Ggs,

$$\text{As } PE = PN : EF :: Ee : er = \frac{EF}{PN} \times Ee;$$

$$\text{And } KG = KD : FG :: Gg : Gs = \frac{FG}{KD} \times Gg.$$

$$\text{But } er = Gs; \text{ therefore } \frac{EF}{PN} \times Ee = \frac{FG}{KD} \times Gg.$$

$$\text{Hence } Ee = \frac{PN \times FG}{KD \times EF} \times Gg.$$

And by ſubſtituting this value of Ee in the former equation, we have the time of deſcribing $Ee = \frac{t \times PN \times FG \times Gg}{2KD \times EF \times \sqrt{BF \times 2PN}}$: But by the nature of the circle $FG = \sqrt{BF \times FN}$, and $EF = \sqrt{PN + PF + FN}$. Hence, by ſubſtitution, we obtain the time of deſcribing

$$Ee = \frac{t \times PN \times \sqrt{BF \times FN} \times Gg}{2KD \times \sqrt{PN + PF \times FN} \times \sqrt{BF \times 2PN}} = \frac{t \times \sqrt{PN} \times Gg}{2KD \times \sqrt{PN + PF} \times \sqrt{2}} = \frac{t \times \sqrt{2PN} \times Gg}{4KD \times \sqrt{PN + PF}} = \frac{t \times \sqrt{2PN}}{2BN \times \sqrt{2PN - NF}} \times Gg.$$

But NF, in its mean quantity for all the arches Gg, is nearly equal to NK; for if the ſemicircle deſcribed on the diameter BN, which correſponds to the whole arch AN, be divided into

Pendulum. into an indefinite number of equal arches, Gg, &c. the fum of all the lines NF, will be equal to as many times NK, as there are arches in the femicircle equal to Gg; therefore the time of defcribing $Ee = \frac{t \times \sqrt{2PN}}{2BN \times \sqrt{2PN - NK}} \times Gg$. Whence the time of defcribing the arch AED $= \frac{t \times \sqrt{2PN}}{2BN \times \sqrt{2PN - NK}} \times BGN$; and the time of defcribing the whole arch ADC, or the time of one vibration, is $= \frac{t \times \sqrt{2PN}}{2BN \times \sqrt{2PN - NK}} \times 2BGN$. But when the arch ANC is very fmall, NK vanifhes, and then the time of vibration in a very fmall arc is $= \frac{t \times \sqrt{2PN}}{2BN \times \sqrt{2PN}} \times 2BGN = \frac{1}{2}t \times \frac{2BGN}{BN}$. Now if t be the time of defcent through 2PN; then fince the fpaces defcribed are as the fquares of the times, $\frac{1}{2}t$ will be the time of defcent through $\frac{1}{2}$PN: therefore the diameter BN is to the circumference 2BGN, as the time of falling through half the length of the pendulum is to the time of one vibration.

Prop. IV. The length of a pendulum vibrating feconds is to twice the fpace through which a body falls in one fecond, as the fquare of the diameter of a circle is to the fquare of its circumference.

Let $d =$ diameter of a circle $= 1$, $c =$ circumference $= 3.14159$, &c. t to the time of one vibration, and p the length of the correfponding pendulum; then by the laft propofition $c : d :: 1'' : \frac{d}{c} =$ time of falling through half the length of the pendulum. Let $s =$ fpace defcribed by a body falling perpendicularly in the firft fecond: then fince the fpaces defcribed are in the fubduplicate ratio of the times of defcription, therefore $1'' : \frac{d}{c} :: \sqrt{s} : \sqrt{\frac{1}{2}p}$. Hence $c^2 : d^2 :: 2s : p$.

It has been found by experiment, that in latitude $51\frac{1}{2}^{\circ}$ a body falls about 16.11 feet in the firft fecond: hence the length of a pendulum vibrating feconds in that latitude is $= \frac{32.22}{3.14159|^2} = 3$ feet 3.174 inches.

Prop. V. The times of the vibrations of two pendulums in fimilar arcs of circles are in a fubduplicate ratio of the lengths of the pendulums.

Fig. 6. Let PN, PO (fig. 6.) be two pendulums vibrating in the fimilar arcs AB, CD; the time of a vibration of the pendulum PN is to the time of a vibration of the pendulum PO in a fubduplicate ratio of PN to PO.

Since the arcs AN, CO are fimilar and fimilarly placed, the time of defcent through AN will be to the time of defcent through CO in the fubduplicate ratio of AN to CO: but the times of defcent through the arcs AN and CO are equal to half the times of vibration of the pendulums PN, PO refpectively. Hence the time of vibration of the pendulum PN in the arc AB is to the time of vibration of the pendulum PO in the fimilar arc CD in the fubduplicate ratio of AN to CO: and fince the radii PN, PO are proportional to the fimilar arcs AN, CO, therefore the time of vibration of the pendulum PN will be to the time of vibration of the pendulum PO in a fubduplicate ratio of PN to PO. Pendulum.

If the length of a pendulum vibrating feconds be 39.174 inches, then the length of a pendulum vibrating half feconds will be 9.793 inches. For $1'' : \frac{1}{2}'' :: \sqrt{39.174} : \sqrt{x}$; and $1 : \frac{1}{4} :: 39.174 : x$. Hence $x = \frac{39.174}{4} = 9.793$.

Prop. VI. The lengths of pendulums vibrating in the fame time, in different places, will be as the forces of gravity.

For the velocity generated in any given time is directly as the force of gravity, and inverfely as the quantity of matter. Now the matter being fuppofed the fame in both pendulums, the velocity is as the force of gravity; and the fpace paffed through in a given time will be as the velocity; that is, as the gravity.

Cor. Since the lengths of pendulums vibrating in the fame time in fmall arcs are as the gravitating forces, and as gravity increafes with the latitude on account of the fpheroidal figure of the earth and its rotation about its axis; hence the length of a pendulum vibrating in a given time will be variable with the latitude, and the fame pendulum will vibrate flower the nearer it is carried to the equator.

Prop. VII. The time of vibrations of pendulums of the fame length, acted upon by different forces of gravity, are reciprocally as the fquare roots of the forces.

For when the matter is given, the velocity is as the force and time; and the fpace defcribed by any given force is as the force and fquare of the time. Hence the lengths of pendulums are as the forces and the fquares of the times of falling through them. But thefe times are in a given ratio to the times of vibration; whence the lengths of pendulums are as the forces and the fquares of the times of vibration. Therefore, when the lengths are given, the forces will be reciprocally as the fquare of the times, and the times of vibration reciprocally as the fquare roots of the forces.

Cor. Let $p =$ length of pendulum, $g =$ force of gravity, and $t =$ time of vibration. Then fince $p = g \times t^2$. Hence $g = p \times \frac{1}{t^2}$; and $t = \sqrt{p \times \frac{1}{g}}$.

That is, the forces in different places are directly as the lengths of the pendulums, and inverfely as the fquare roots of the times of vibration; and the times of vibration are directly as the fquare roots of the lengths of the pendulums, and inverfely as the fquare roots of the gravitating forces.

Prop. VIII. A pendulum which vibrates in the arch of a cycloid defcribes the greateft and leaft vibrations in the fame time.

This property is demonftrated only on a fuppofition that the whole mafs of the pendulum is concentrated in a point: but this cannot take place in any really vibrating body; and when the pendulum is of finite magnitude, there is no point given in pofition which determines the length of the pendulum; on the contrary the centre of ofcillation will not occupy the fame place in the given body, when defcribing different parts of the tract it moves through, but will continually be moved in refpect of the pendulum itfelf during its vibration. It may, however, be obferved, that Huyghens, aware that

a

a pendulum ball ſuſpended at the end of a thread vibrating between cycloids, would not deſcribe a cycloid with its centre of oſcillation, gave a very beautiful and ſimple method of ſuſpenſion, which ſecured its vibrations in that curve. Harriſon, whoſe authority is next, inſiſts on the advantage of wide vibrations, and in his own clocks, he always uſed cycloidal checks. This circumſtance has prevented any general determination of the time of vibration in a cycloidal arc, except in the imaginary caſe referred to.

There are many other obſtacles which concur in rendering the application of this curve to the vibration of pendulums deſigned for the meaſures of time the ſource of errors far greater than thoſe which by its peculiar property it is intended to obviate; and it is now wholly diſuſed in practice.

Although the times of vibration of a pendulum in different arches be nearly equal, yet from what has been ſaid, it will appear, that if the ratio of the leaſt of theſe arches to the greateſt be conſiderable, the vibrations will be formed in different times; and the difference, though ſmall, will become ſenſible in the courſe of one or more days. In clocks uſed for aſtronomical purpoſes, it will therefore be neceſſary to obſerve the arc of vibration; which if different from that deſcribed by the pendulum when the clock keeps time, there a correction muſt be applied to the time ſhown by the clock. This correction, expreſſed in ſeconds of time, will be equal to the half of three times the difference of the ſquare of the given arc, and of that of the arc deſcribed by the pendulum when the clock keeps time, theſe arcs being expreſſed in degrees; and ſo much will the clock gain or loſe according as the firſt of theſe arches is leſs or greater than the ſecond.

Thus, if a clock keep time when the pendulum vibrates in the arch of 3°, it will loſe $10\frac{1}{2}$ ſeconds daily in an arch of 4 degrees.

For $\overline{4^2-3^2} \times \frac{3}{2} = 7 \times \frac{3}{2} = 10\frac{1}{2}$ ſeconds.

The length of a pendulum rod increaſes with heat; and the quantity of expanſion anſwering to any given degree of heat is experimentally found by means of a pyrometer †; but the degree of heat at any given time is ſhown by a thermometer: hence that inſtrument ſhould be placed within the clock caſe at a height nearly equal to that of the middle of the pendulum; and its height, for this purpoſe, ſhould be examined at leaſt once a day. Now by a table conſtructed to exhibit the daily quantity of acceleration or retardation of the clock anſwering to every probable height of the thermometer, the correſponding correction may be obtained. It is alſo neceſſary to obſerve, that the mean height of the thermometer during the interval ought to be uſed. In Six's thermometer this height may be eaſily obtained; but in thermometers of the common conſtruction it will be more difficult to find this mean.

† See *Pyrometer*, CHEMISTRY *Index*.

It had been found, by repeated experiments, that a braſs rod equal in length to a ſecond pendulum will expand or contract $\frac{1}{1000}$ part of an inch by a change of temperature of one degree in Fahrenheit's thermometer; and ſince the times of vibration are in a ſubduplicate ratio of the lengths of the pendulum, hence an expanſion or contraction of $\frac{1}{1000}$ part of an inch will anſwer nearly to one ſecond daily: therefore a change of one degree in the thermometer will occaſion a difference in the rate of the clock equal to one ſecond daily.

Whence, if the clock be ſo adjuſted as to keep time when the thermometer is at 55°, it will loſe 10 ſeconds daily when the thermometer is at 65°, and gain as much when it is at 45°.

Hence the daily variation of the rate of the clock from ſummer to winter will be very conſiderable. It is true indeed that moſt pendulums have a nut or regulator at the lower end, by which the bob may be raiſed or lowered a determinate quantity; and therefore while the height of the thermometer is the ſame, the rate of the clock will be uniform. But ſince the ſtate of the weather is ever variable, and as it is impoſſible to be raiſing or lowering the bob of the pendulum at every change of the thermometer, therefore the correction formerly mentioned is to be applied. This correction, however, is in ſome meaſure liable to a ſmall degree of uncertainty; and in order to avoid it altogether, ſeveral contrivances have been propoſed by conſtructing a pendulum of different materials, and ſo diſpoſing them that their effects may be in oppoſite directions, and thereby counterbalance each other; and by this means the pendulum will continue of the ſame length.

Mercurial Pendulum.

Mercurial PENDULUM. The firſt of theſe inventions is that by the celebrated Mr George Graham. In this, the rod of the pendulum is a hollow tube, into which a ſufficient quantity of mercury is introduced. Mr Graham firſt uſed a glaſs tube, and the clock to which it was applied was placed in the moſt expoſed part of the houſe. It was kept conſtantly going, without having the hands or pendulum altered, from the 9th of June 1722 to the 14th of October 1725, and its rate was determined by tranſits of fixed ſtars. Another clock made with extraordinary care, having a pendulum about 60 pounds weight, and not vibrating above one degree and a half from the perpendicular, was placed beſide the former, in order the more readily to compare them with each other, and that they might both be equally expoſed. The reſult of all the obſervations was this, that the irregularity of the clock with the quickſilver pendulum exceeded not, when greateſt, a ſixth part of that of the other clock with the common pendulum, but for the greateſt part of the year not above an eighth or ninth part; and even this quantity would have been leſſened, had the column of mercury been a little ſhorter: for it differed a little the contrary way from the other clock, going faſter with heat and ſlower with cold. To confirm this experiment more, about the beginning of July 1723 Mr Graham took off the heavy pendulum from the other clock, and made another with mercury, but with this difference, that inſtead of a glaſs tube he uſed a braſs one, and varniſhed the inſide to ſecure it from being injured by the mercury. This pendulum he uſed afterwards, and found it about the ſame degree of exactneſs as the other.

Philoſ. Tranſ. 1726. N° 392.

Gridiron Pendulum.

The *Gridiron* PENDULUM is an ingenious contrivance for the ſame purpoſe. Inſtead of one rod, this pendulum is compoſed of any convenient number of rods, as five, ſeven, or nine; being ſo connected, that the effect of one ſet of them counteracts that of the other ſet; and therefore, being properly adjuſted to each other, the centres of ſuſpenſion and oſcillation will always be equidiſtant. Fig. 7. repreſents a gridiron pendulum compoſed of nine rods, ſteel and braſs alternately. The two outer rods AB, CD, which are of ſteel, are faſtened to the croſs pieces AC, BD by means

Fig. 7.

Pendulum. means of pins. The next two rods, EF, GH, are of brafs, and are faftened to the lower bar BD, and to the fecond upper bar EG. The two following rods are of fteel, and are faftened to the crofs bars EG and IK. The two rods adjacent to the central rod being of brafs, are faftened to the crofs pieces IK and LM; and the central rod, to which the ball of the pendulum is attached, is fufpended from the crofs piece LM, and paffes freely through a perforation in each of the crofs bars IK, BD. From this difpofition of the rods, it is evident that, by the expanfion of the extreme rods, the crofs piece BD, and the two rods attached to it, will defcend: but fince thefe rods are expanded by the fame heat, the crofs piece EG will confequently be raifed, and therefore alfo the two next rods; but becaufe thefe rods are alfo expanded, the crofs bar IK will defcend; and by the expanfion of the two next rods, the piece LM will be raifed a quantity fufficient to counteract the expanfion of the central rod. Whence it is obvious, that the effect of the fteel rods is to increafe the length of the pendulum in hot weather, and to diminifh it in cold weather, and that the brafs rods have a contrary effect upon the pendulum. The effect of the brafs rods muft, however, be equivalent not only to that of the fteel rods, but alfo to the part above the frame and fpring, which connects it with the cock, and to that part between the lower part of the frame and the centre of the ball.

M. Thiout. Another excellent contrivance for the fame purpofe is defcribed in a French author on clock-making. It was ufed in the north of England by an ingenious artift about 40 years ago. This invention is as follows: A bar of the fame metal with the rod of the pendulum, and of the fame dimenfions, is placed againft the back part of the clock cafe; from the top of this a part projects, to which the upper part of the pendulum is connected by two fine pliable chains or filken ftrings, which juft below pafs between two plates of brafs, whofe lower edges will always terminate the length of the pendulum at the upper end. Thefe plates are fupported on a pedeftal fixed to the back of the cafe. The bar refts upon an immoveable bafe at the lower part of the cafe; and is inferted into a groove, by which means it is always retained in the fame pofition. From this conftruction, it is evident that the extenfion or contraction of this bar, and of the rod of the pendulum, will be equal, and in contrary directions. For fuppofe the rod of the pendulum to be expanded any given quantity by heat; then, as the lower end of the bar refts upon a fixed point, the bar will be expanded upwards, and raife the upper end of the pendulum juft as much as its length was increafed; and hence its length below the plates will be the fame as before.

Of this pendulum, fomewhat improved by Mr Crofthwaite watch and clock-maker, Dublin, we have the following defcription in the Tranfactions of the Royal Irifh Academy, 1788.—"A and B (fig. 8.) are two rods of fteel forged out of the fame bar, at the fame time, of the fame temper, and in every refpect fimilar. On the top of B is formed a gibbet C; this rod is firmly fupported by a fteel bracket D, fixed on a large piece of marble E, firmly fet into the wall F, and having liberty to move freely upwards between crofs ftaples of brafs, 1, 2, 3, 4, which touch only in a point in front and rear (the ftaples having been carefully formed for that purpofe); to the other rod is firmly fixed by its centre the lens G, of 24 pounds weight, although it fhould in ftrictnefs be a little below it. This pendulum is fufpended by a fhort fteel fpring on the gibbet at C; all which is entirely independent of the clock. To the back of the clock plate I are firmly fcrewed two cheeks nearly cycloidal at K, exactly in a line with the centre of the verge L. The maintaining power is applied by a cylindrical fteel ftud, in the ufual way of regulators, at M. Now, it is very evident, that any expanfion or contraction that takes place in either of thefe exactly fimilar rods, is inftantly counteracted by the other; whereas in all *compenfation* pendulums compofed of different materials, however juft calculation may feem to be, that can never be the cafe, as not only different metals, but alfo different bars of the fame metal, that are not manufactured at the fame time, and exactly in the fame manner, are found by a good pyrometer to differ materially in their degrees of expanfion and contraction, a very fmall change affecting one and not the other."

Fig. 8.

Fir Pendulum. The expanfion or contraction of ftraight grained fir wood lengthwife, by change of temperature, is fo fmall, that it is found to make very good pendulum rods. The wood called *fapadillo* is faid to be ftill better. There is good reafon to believe, that the previous baking, varnifhing, gilding, or foaking of thefe woods in any melted matter, only tends to impair the property that renders them valuable. They fhould be fimply rubbed on the outfide with wax and a cloth. In pendulums of this conftruction the error is greatly diminifhed, but not taken away.

Angular Pendulum. *Angular* PENDULUM, is formed of two pieces or legs like a fector, and is fufpended by the angular point. This pendulum was invented with a view to diminifh the length of the common pendulum, but at the fame time to preferve or even increafe the time of vibration. In this pendulum, the time of vibration depends on the length of the legs, and on the angle contained between them conjointly, the duration of the time of vibration increafing with the angle. Hence a pendulum of this conftruction may be made to ofcillate in any given time. At the lower extremity of each leg of the pendulum is a ball or bob as ufual. It may be eafily fhown, that in this kind of a pendulum, the fquares of the times of vibration are as the fecants of half the angle contained by the legs: hence if a pendulum of this conftruction vibrates half feconds when its legs are clofe, it will vibrate whole feconds when the legs are opened, fo as to contain an angle equal to 151° 2½'.

Conical or Circular Pendulum. *The Conical or Circular* PENDULUM, is fo called from the figure defcribed by the ftring or ball of the pendulum. This pendulum was invented by Mr Huygens, and is alfo claimed by Dr Hooke.

In order to underftand the principles of this pendulum, it will be neceffary to premife the following lemma, viz. the times of all the circular revolutions of a heavy globular body, revolving within an inverted hollow paraboloid, will be equal, whatever be the radii of the circle defcribed by that body.

In order therefore, to conftruct the pendulum fo that its ball may always defcribe its revolutions in a paraboloid furface, it will be neceffary that the rod of the pendulum be flexible, and that it be fufpended in fuch

Fig. 1.

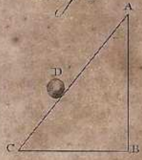


Fig. 2.

Fig. 8.

Fig. 7.

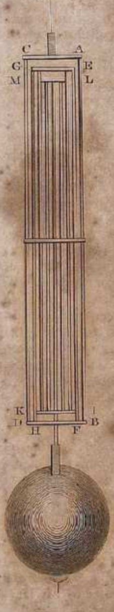


Fig. 3.

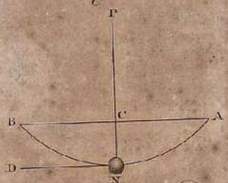


Fig. 4.

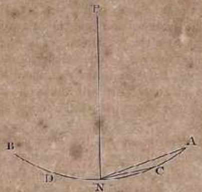


Fig. 5.

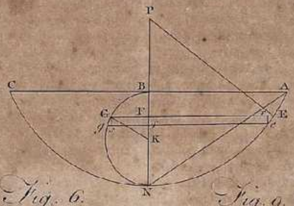


Fig. 6.

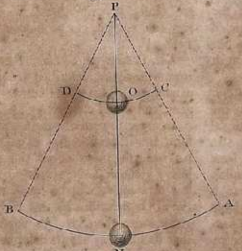
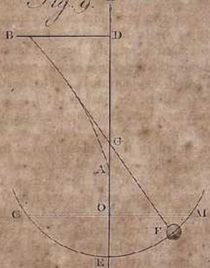


Fig. 9.



Pendulum. Fig. 9.

such a manner as to form the evolute of the given parabola. Hence, let KH (fig. 9.) be an axis perpendicular to the horizon, having a pinion at K moved by the last wheel in the train of the clock; and a hardened steel point at H moving in an agate pivot, to render the motion as free as possible. Now, let it be required that the pendulum shall perform each revolution in a second, then the paraboloid surface it moves in must be such whose *latus rectum* is double the length of the common half second pendulum. Let O be the focus of the parabola MEC, and MC the *latus rectum*; and make $AE=MO=\frac{1}{2}MC=$ the length of a common half second pendulum. At the point A of the verge, let a thin plate AB be fixed at one end, and at the other end B let it be fastened to a bar or arm BD perpendicular to DH, and to which it is fixed at the point D. The figure of the plate AB is that of the evolute of the given parabola MEC.

The equation of this evolute, being also that of the semicubical parabola, is $\frac{27}{16}px^2=y^3$.—Let $\frac{27}{16}p=P$; then $Px^2=y^3$, and in the focus $P=2y$. In this case $2x^2=y^2=\frac{1}{4}P^2$: hence $x^2=\frac{1}{8}P^2$, and $x=P\sqrt{\frac{1}{8}}=\frac{27}{16}p\sqrt{\frac{1}{8}}=$ the distance of the focus from the vertex A.—By assuming the value of x, the ordinates of the curve may be found; and hence it may be easily drawn.

The string of the pendulum must be of such a length that when one end is fixed at B, it may lie over the plate AB, and then hang perpendicular from it, so that the centre of the bob may be at E when at rest. Now, the verge KH being put into motion, the ball of the pendulum will begin to gyrate, and thereby conceive a centrifugal force which will carry it out from the axis to some point F, where it will circulate seconds or half seconds, according as the line AE is 9.8 inches, or $2\frac{4}{5}$ inches, and AB answerable to it.

One advantage possessed by a clock having a pendulum of this construction is, that the second hand moves in a regular and uniform manner, without being subject to those jerks or starts as in common clocks; and the pendulum is entirely silent.

Theory has pointed out several other pendulums, known by the names of *Elliptical*, *Horizontal*, *Rotulary*, &c. pendulums. These, however, have not as yet attained that degree of perfection as to supplant the common pendulum.

Observing that both the gridiron and mercurial pendulums are subject to many inconveniences and errors, Mr Kater has attempted to construct one possessing such properties in respect of cheapness and accuracy as he thinks might justly give it the preference to any other. As wood possesses a less degree of expansibility by means of heat than any other substance; on this account, if it could be rendered quite impervious to moisture, it would be the best of all substances for the rod of a pendulum; and as it also appears that zinc, above all other metals, possesses the greatest degree of expansibility by means of heat, he considered it the best substance which could be employed for a compensation. His next object was to institute a set of delicate experiments, in order to ascertain the precise degree of the expansibility of wood by the application of heat, and he discovered by the use of a pyrometer, that a rod of very dry, well seasoned white wood, four feet long, three-fourths of an inch broad, and one-fourth of an inch thick, when exposed in an oven to the temperature of 235°, had contracted. Being again put into the oven, where it was permitted to remain for a long time, till it became a little discoloured, with a view to dissipate the whole of the moisture, it was placed in the pyrometer, and allowed to remain till it reached the temperature of the room, or 49°, when it was found to have contracted 0.0205 of an inch with 186° of Fahrenheit, from which we obtain by proportion 0.0049 of an inch for the expansion of one foot with 180° difference of temperature. Thus,

Pendulum ‖ Peniel.

$$\frac{0.0205\times 180}{186}=\frac{0.0198}{4}=0.0049.$$

But for a general description of this pendulum, and a full account of the manner in which it is constructed, we must refer our readers to the inventor's own paper, Nichol. Jour. vol. xx. p. 214.

Besides the use of the pendulum in measuring time, it has also been suggested as a proper standard for measures of length. See MEASURE.

PENEA, a genus of plants belonging to the tetrandria class, and in the natural method ranking with those of which the order is doubtful. See BOTANY *Index*.

PENELOPE, in fabulous history, the daughter of Icarus, married Ulysses, by whom she had Telemachus. During the absence of Ulysses, who was gone to the siege of Troy, and who staid 20 years from his dominions, several princes charmed with Penelope's beauty, told her that Ulysses was dead, offered to marry her, and pressed her to declare in their favour. She promised compliance on condition they would give her time to finish a piece of tapestry she was weaving; but at the same time she undid in the night what she had done in the day, and by this artifice eluded their importunity till Ulysses's return.

PENELOPE, a genus of birds of the order of *gallinæ*. See ORNITHOLOGY *Index*.

PENESTICA, (Antonine), a town of the Helvetii, situated between the Lacus Lausonius and Salodurum; called *Petenisca* by Peutinger. Thought now to be *Biel*, (Cluverius); the capital of a small territory in Swisserland.

PENEUS, (Strabo); a river running through the middle of Thessaly, from west to east, into the Sinus Thermaicus, between Olympus and Ossa, near Tempe of Thessaly, rising in Mount Pindus, (Ovid, Val. Flaccus).

PENETRALE, a sacred room or chapel in private houses, which was set apart for the worship of the household gods among the ancient Romans. In temples also there were *penetralia*, or apartments of distinguished sanctity, where the images of the gods were kept, and certain solemn ceremonies performed.

PENGUIN, or PINGUIN. See PENGUIN, ORNITHOLOGY *Index*.

PENICILLUS, among surgeons, is used for a tent to be put into wounds or ulcers.

PENIEL, or PENUEL, a city beyond Jordan, near the ford or brook Jabbok. This was the occasion of its name. Jacob, upon his return from Mesopotamia, (Gen. xxxii. 24, &c.) made a stop at the brook Jabbok: and very early the next morning, after he had sent all the

the people before, he remained alone, and behold an angel came, and wrestled with him till the day began to appear. Then the angel said to Jacob, Let me go, for the morning begins to appear. Jacob answered, I shall not let you go from me till you have given me your blessing. The angel blessed him then in the same place, which Jacob thence called Peniel, saying, I have seen God face to face, yet continue alive.

In following ages the Israelites built a city in this place, which was given to the tribe of Gad. Gideon, returning from the pursuit of the Midianites, overthrew the tower of Peniel, (Judges viii. 17.), and put all the inhabitants of the city to death, for having refused sustenance to him and his people, and having answered him in a very insulting manner. Jeroboam the son of Nebat rebuilt the city of Peniel, (1 Kings xii. 25.). Josephus says, that this prince there built himself a palace.

PENINNAH, the second wife of Elkanah, the father of Samuel. Peninnah had several children, (1 Sam. i. 2, 3, &c.), but Hannah, who afterwards was mother of Samuel, was for a great while barren: Peninnah, instead of giving the glory to God, the author of fruitfulness, was elevated with pride, and insulted her rival Hannah. But the Lord having visited Hannah, Peninnah was thereupon humbled: and some interpreters think, that God took away her children from her, or at least that she had no more after this time, according to the words of the song of Hannah, (1 Sam. ii. 5.), "The barren hath born seven, and she that hath many children is waxed feeble."

PENINSULA, in *Geography*, a portion or extent of land joining to the continent by a narrow neck or isthmus, the rest being encompassed with water.

PENIS, in *Anatomy*. See Anatomy *Index*.

PENITENCE, is sometimes used for a state of repentance, and sometimes for the act of repenting. See Repentance. It is also used for a discipline, or punishment attending repentance; more usually called *penance*. It also gives title to several religious orders, consisting either of converted debauchees, and reformed prostitutes, or of persons who devote themselves to the office of reclaiming them. Of this latter kind is the

Order of Penitence *of St Magdalen*, established about the year 1272 by one Bernard, a citizen of Marseilles, who devoted himself to the work of converting the courtezans of that city. Bernard was seconded by several others; who, forming a kind of society, were at length erected into a religious order by Pope Nicholas III. under the rule of St Augustine. F. Gesnay says, that they also made a religious order of the penitents, or women they converted, giving them the same rules and observances which they themselves kept.

Congregation of Penitence *of St Magdalen at Paris*, owed its rise to the preaching of F. Tisseran, a Franciscan, who converted a vast number of courtezans about the year 1492. Louis duke of Orleans gave them his house for a monastery; or rather, as appears by their constitutions, Charles VIII. gave them the hotel called *Bochaigne*, whence they were removed to St George's chapel, in 1572. By virtue of a brief of Pope Alexander, Simon bishop of Paris, in 1497, drew up for them a body of statutes, and gave them the rule of St Augustine. It was necessary, before a woman could be admitted, that she had first committed the sin of the flesh. None were admitted who were above 35 years of age.

Till the beginning of the last century, none but penitents were admitted; but since its reformation by Mary Alvequin, in 1616, none have been admitted but maids, who, however, still retain the ancient name penitents.

PENITENTS, an appellation given to certain fraternities of penitents distinguished by the different shape and colour of their habits. These are secular societies, who have their rules, statutes, and churches, and make public processions under their particular crosses or banners. Of these there are more than a hundred, the most considerable of which are as follow: the white penitents, of which there are several different sorts at Rome, the most ancient of which was constituted in 1264; the brethren of this fraternity every year give portions to a certain number of young girls, in order to their being married: their habit is a kind of white sackloth, and on the shoulder is a circle, in the middle of which is a red and white cross. Black penitents, the most considerable of which are the brethren of mercy, instituted in 1488 by some Florentines, in order to assist criminals during their imprisonment, and at the time of their death: on the day of execution they walk in procession before them, singing the seven penitential psalms and the litanies; and after they are dead, they take them down from the gibbet and bury them; their habit is black sackcloth. There are others whose business it is to bury such persons as are found dead in the streets: these wear a death's head on one side of their habit. There are also blue, gray, red, green, and violet penitents; all of whom are remarkable for little else besides the different colours of their habits.

Mabillon tells us, that at Turin there are a set of penitents kept in pay to walk through the streets in procession, and cut their shoulders with whips, &c.

Penitents, or *Converts of the name of Jesus*, a congregation of religious at Seville in Spain, consisting of women who had led a licentious life, founded in 1550. This monastery is divided into three quarters: one for professed religious; another for novices; a third for those who are under correction. When these last give signs of a real repentance, they are removed into the quarter of the novices, where, if they do not behave themselves well, they are remanded to their correction. They observe the rule of St Augustine.

Penitents of Orvieto, are an order of nuns, instituted by Antony Simoncelli, a gentleman of Orvieto in Italy. The monastery he built was at first designed for the reception of poor girls, abandoned by their parents, and in danger of losing their virtue. In 1662 it was erected into a monastery, for the reception of such as, having abandoned themselves to impurity, were willing to take up, and consecrate themselves to God by solemn vows. Their rule is that of the Carmelites.

These religious have this in peculiar, that they undergo no noviciate. All required is, that they continue a few months in the monastery in a secular habit; after which they are admitted to the vows.

PENITENTIAL, an ecclesiastical book, retained among the Romanists; in which is prescribed what relates to the imposition of penance and the reconciliation of penitents. See Penance.

There are various penitentials, as the Roman penitential, that of the venerable Bede, that of Pope Gregory III. &c.

PENITENTIARY, in the ancient Christian church, a

a name given to certain presbyters or priests, appointed in every church to receive the private confessions of the people, in order to facilitate public discipline, by acquainting them what sins were to be expiated by public penance, and to appoint private penance for such private crimes as were not proper to be publicly censured.

PENITENTIARY, at the court of Rome, is an office in which are examined and delivered out the secret bulls, graces, or dispensations relating to cases of conscience, confessions, &c.

PENITENTIARY, is also an officer, in some cathedrals, vested with power from the bishop to absolve, in cases reserved to him. The pope has at present his grand penitentiary, who is a cardinal and the chief of the other penitentiary priests established in the church of Rome, who consult him in all difficult cases. He presides in the penitentiary, dispatches dispensations, absolutions, &c. and has under him a regent and 24 proctors, or advocates of the sacred penitentiary.

PENMAN-MAWR, a mountain in Caernarvonshire, 1400 feet high. It hangs perpendicularly over the sea, at so vast a height, that few spectators are able to look down the dreadful steep. On the side which is next the sea, there is a road cut out of the side of the rock, about six or seven feet wide, which winds up a steep ascent, and used to be defended on one side only by a slight wall, in some parts about a yard high, and in others by only a bank, that scarce rose a foot above the road. The sea was seen dashing its waves 40 fathoms below, with the mountain rising as much above the traveller's head. This dangerous road was a few years ago secured by a wall breast-high, to the building of which the city of Dublin largely contributed, it being in the high road to Holyhead.

PENN, WILLIAM, an eminent writer among the Quakers, and the planter and legislator of Pensylvania, was the son of Sir William Penn, and was born at London in 1644. In 1660, he was entered a gentleman of Christ-Church, in Oxford; but having before received an impression from the preaching of one Thomas Loe a Quaker, withdrew with some other students from the national worship, and held private meetings, where they preached and prayed amongst themselves. This giving great offence to the heads of the college, Mr Penn, though but 16 years of age, was fined for nonconformity; and continuing his religious exercises, was at length expelled the college. Upon his return home, he was on the same account, treated with great severity by his father, who at last turned him out of doors; but his resentment afterwards abating, he sent him to France in company with some persons of quality; where he continued a considerable time, and returned not only well skilled in the French language, but a polite and accomplished gentleman. About the year 1666, his father committed to his care a considerable estate in Ireland. Being found in one of the Quakers meetings in Cork, he, with many others, was thrown into prison; but on his writing to the earl of Orrery, was soon discharged. However, his father being informed he still adhered to his opinions, sent for him to England, and finding him inflexible to all his arguments, turned him out of doors a second time. About the year 1668, he became a public preacher among the Quakers; and that year was committed close prisoner to the Tower, where he wrote several treatises. Being discharged after seven months imprisonment, he went to Ireland, where he also preached amongst the Quakers. Returning to England, he was in 1670 committed to Newgate, for preaching in Gracechurch-street meeting-house, London; but being tried at the sessions-house of the Old Bailey, he was acquitted. In September the same year, his father died; and being perfectly reconciled to him, left him both his paternal blessing and a good estate. But his persecutions were not yet at an end; for in 1671 he was committed to Newgate for preaching at a meeting in Wheeler-street, London; and during his imprisonment, which continued six months, he also wrote several treatises. After his discharge, he went into Holland and Germany; and in the beginning of the year 1672, married and settled with his family at Rickmansworth in Hertfordshire. The same year he published several pieces; and particularly one against Reeve and Muggleton. In 1677, he again travelled into Holland and Germany in order to propagate his opinions; and had frequent conversations with the princess Elizabeth, daughter to the queen of Bohemia, and sister to the princess Sophia, mother to King Geo. I. In 1681, King Charles II. in consideration of the services of Mr Penn's father, and several debts due to him from the crown at the time of his decease, granted Mr Penn and his heirs the province lying on the west side of the river Delaware in North America, which from thence obtained the name of *Pensylvania*. Upon this Mr Penn published a brief account of that province, with the king's patent; and proposing an easy purchase of lands, and good terms of settlement for such as were inclined to remove thither, many went over. These having made and improved their plantations to good advantage, the governor, in order to secure the planters from the native Indians, appointed commissioners to purchase the land he had received from the king of the native Indians, and concluded a peace with them. The city of Philadelphia was planned and built; and he himself drew up the fundamental constitutions of Pensylvania in 24 articles. In 1681, he was elected a member of the Royal Society; and the next year he embarked for Pensylvania, where he continued about two years, and returned to England in August 1684. Upon the accession of King James to the throne, he was taken into a great degree of favour with his majesty, which exposed him to the imputation of being a Papist; but from which he fully vindicated himself. However, upon the Revolution, he was examined before the council in 1688, and obliged to give security for his appearance on the first day of next term, which was afterwards continued. He was several times discharged and examined; and at length warrants being issued out against him, he was obliged to conceal himself for two or three years. Being at last permitted to appear before the king and council, he represented his innocence so effectually that he was acquitted. In August 1699, he, with his wife and family, embarked for Pensylvania; whence he returned in 1701, in order to vindicate his proprietary right, which had been attacked during his absence. Upon Queen Anne's accession to the crown, he was in great favour with her, and was often at court. But, in 1707, he was involved in a lawsuit with the executors of a person who had been formerly his steward; and, though many thought him aggrieved, the court of chancery did not think proper to relieve him; upon which account he was obliged to live within

Penn, Pennant.

within the rules of the Fleet for several months, till the matter in dispute was accommodated. He died in 1718.

At one period of his life, Penn lodged in a house in Norfolk-street in the Strand. In the entrance to it he had a peeping-hole, through which he could see any person that came to him. A creditor one day sent in his name, and having been made to wait more than a reasonable time, he knocked for the servant, whom he asked, "Will not thy master see me?" "Friend (answered the servant) he has seen thee, but he does not like thee."

Mr Penn's friendly and pacific manner of treating the Indians produced in them an extraordinary love for him and his people; so that they have maintained a perfect amity with the English in Pensylvania ever since. He was the greatest bulwark of the Quakers; in whose defence he wrote numberless pieces. Besides the above works, he wrote a great number of others; the most esteemed of which are, 1. His Primitive Christianity revived. 2. His defence of a paper, intitled *Gospel Truths, against the Exceptions of the Bishop of Cork*. 3. His Persuasive to Moderation. 4. His Good Advice to the Church of England, Roman Catholic, and Protestant Dissenter. 5. The Sandy Foundation shaken. 6. No Cross, no Crown. 7. The great case of Liberty of Conscience debated. 8. The Christian Quaker and his Testimony stated and vindicated. 9. A Discourse of the general Rule of Faith and Practice, and Judge of Controversy. 10. England's Present Interest considered. 11. An Address to Protestants. 12. His Reflections and Maxims. 13. His Advice to his Children. 14. His Rise and Progress of the People called *Quakers*. 15. A Treatise on Oaths. Most of these have passed several editions, some of them many. The letters between William Penn and Dr Tillotson, and William Penn and William Popple, Esq. together with Penn's letters to the princess Elizabeth of the Rhine, and the countess of Hornes, as also one to his wife on his going to Pensylvania, are inserted in his works, which were first collected and published in 2 vols. folio; and the parts since selected and abridged into 1 vol. folio, are very much and deservedly admired for the good sense they contain.

PENNANT, Thomas, Esq. a celebrated naturalist, was born in Flintshire, about the year 1726. His family had their residence in that country for several hundred years; and he informs us himself, that he acquired the rudiments of his education at Wrexham, from whence he was sent to Fulham. Not long after this he went to the university of Oxford, where his progress in classical knowledge was very considerable; after which he turned his attention to the study of jurisprudence; but it is no where said that he ever followed the law as a profession.

We are informed that his taste for natural history, for his knowledge of which he afterwards became so conspicuous, was first excited by the perusal of Willoughby's Ornithology, a copy of which had been sent him in a present. He began his travels at home, which was certainly the most proper step, to acquire a knowledge of the manners, curiosities, and productions of his native country, before he attempted to delineate those of any other nation. He then visited the continent, where he acquired additional knowledge respecting his most favourite studies, and became acquainted with some of the most celebrated literary characters which that period produced. When he returned home he married and had two children; but he was 37 years of age before he gained possession of the family estate, after which he took up his residence at Downing.

On the death of his wife he set out again for the continent, where he became acquainted with Voltaire, Buffon, Pallas, and other eminent characters. Being an author as early as the year 1750 (then only 24 years of age), he had acquired a considerable degree of reputation in that capacity, by the time he became acquainted with the forementioned philosophers. His reputation as a naturalist was established by his British Zoology in four vols. 4to, and still farther increased by his epistolary correspondence with so great a man as Linnæus. He undertook a tour to Cornwall at an early period of life, and also felt an irresistible propensity to survey the works of nature in the northern parts of the kingdom. For this purpose he set out for Scotland in 1771, and published an amusing account of his tour in three vols. 4to, which was destined to receive such a share of public favour as to pass through several editions. His Welch tour was published in 1778, and his journey from Chester to London in 1782, in one volume 4to. About 1784 came out his Arctic Zoology, a work which was very much esteemed, both in his own, and in many other countries. He also gave the world a natural history of the parishes of Holywell and Downing, within the latter of which he had resided for more than 50 years. Not long before his death appeared his View of Hindostan, in two vols. 4to, to undertake which it seems he had solicitations from private friends, as well as the wishes of persons entirely unknown to him, which were expressed in the public prints. This was unquestionably a very bold attempt in a man who was turned of 70, a period at which the faculties of the mind must certainly be impaired, especially when exerted with vigour for such a number of years before. Notwithstanding his great age, however, the work is executed in an able manner, bearing a strong resemblance to the introduction of his Arctic Zoology.

He also published a letter on the earthquake which was felt at Downing in Flintshire, in the year 1753; another which was inserted in the Philosophical Transactions in 1756; his Synopsis of Quadrupeds in 1771; a pamphlet on the militia; a paper on the turkey, and a miscellaneous volume.

Almost every species of literary honour was conferred upon him; for he was complimented with the degree of LL. D. by the university in which he was educated; he was also fellow of the Royal Society, and a member of the Society of Antiquaries; a fellow of the Royal Society of Upsal in Sweden; a member of the American Philosophical Society; an honorary member of the Anglo-Linnæan Society, &c. &c.

He was enabled to exhibit the greatest hospitality at his table, in consequence of the ample fortune which was left him at his father's decease, and he gave the profits arising from the sale of several publications to charitable endowments. By his generous patronage a number of engravers met with great encouragement, and he contributed not a little to the promotion of the fine arts. About the age of 50 he married for the second time, a Miss Mostyn, sister of his neighbour, the late Sir Roger Mostyn of Flintshire. The concluding part of his life was cheerful, and it may be affirmed that he scarcely

felt the advances of old age. He died at his seat at Downing in 1798, and in the 72d year of his age.

He inherited from nature a strong and vigorous constitution; his countenance was open and intelligent; his disposition active and cheerful; and his vivacity, both in writing and conversation, made him perpetually entertaining. His heart was kind and benevolent, and in the relations of domestic life his conduct was highly worthy of imitation. The distresses in which his poor neighbours were at any time involved gave him unfeigned uneasiness, and he endeavoured to relieve them by every means in his power. He was possessed of candour, and free from common prejudices, a truth fully evinced in all his publications. The people of Scotland were proud to confess, that he was the first English traveller who had fairly represented their country in its favourable, as well as in its less pleasing appearances. His style is lively, and fitted to convey the ideas which he intended to express, but it is not always correct. In zoology his arrangement is judicious, and his descriptions characteristic. If we discover several traces of vanity in those works which he published near the close of life, it ought to be remembered that it is the vanity of an old man, which is seldom disagreeable; and it is also the vanity of one who in the meridian of life gave the world such fruits of his labours as will be justly admired in all succeeding ages, while a taste for polite and valuable literature is cherished among men.

PENNATULA, or SEA-PEN, a genus of animals belonging to the order zoophyta. See HELMINTHOLOGY *Index*.

PENNI, GIOVANNI FRANCISCO, born at Florence in 1488, was the disciple of Raphael, who observing his genius and integrity, intrusted his domestic concerns entirely to his management; by which means he got the appellation of *il fatore*, or the "steward," which he retained ever after. The genius of Penni was universal; but his greatest pleasure was in painting landscapes and buildings: he was an excellent designer, and coloured extremely well in oil, distemper, and fresco. He painted portraits in an exquisite style; and had such happy natural talents, that Raphael left him heir to his fortune in partnership with Julio Romano his fellow-disciple. After Raphael's death, Penni painted many pictures at Rome, particularly in the palace of Chigi, so exactly in the style of his master, that they might not undeservedly have been imputed to him: he finished, in conjunction with Julio and Pierino del Vaga, the celebrated designs of the battles of Constantine, and others, which Raphael had left imperfect; but differing with them about a copy of the transfiguration, which the pope intended for the king of France, they separated. Penni went to Naples; but the air of that country disagreeing with his constitution, he died soon after in 1528. He had a brother called *Lucca Penni*, who worked at Genoa and other parts of Italy in conjunction with Pierino del Vaga, who married his sister; he went thence to England, where he worked for Henry VIII. and for several merchants; was employed by Francis I. at Fontainbleau; but at last quitted the pencil, and devoted himself to engraving.

PENNY, or PENY, in commerce, an ancient English coin, which had formerly considerable currency; but is now generally dwindled into an imaginary money, or money of account. Camden derives the word from the Latin *pecunia*, "money."

The ancient English penny, penig, or pening, was the first silver coin struck in England; nay, and the only one current among our Saxon ancestors: as is agreed by Camden, Spelman, Dr Hicks, &c.

The penny was equal in weight to our three-pence; five of them made one shilling, or scilling Saxon; 30 a mark or mancuse, equal to 7*s*. 6*d*.

Till the time of King Edw. I. the penny was struck with a cross, so deeply indented in it, that it might be easily broke, and parted, on occasion, into two parts, thence called *half-pennies*; or into four, thence called *fourthings* or *farthings*.—But that prince coined it without indenture, in lieu of which, he first struck round halfpence and farthings.

He also reduced the weight of the penny to a standard; ordering that it should weigh 32 grains of wheat, taken out of the middle of the ear.—This penny was called the *penny sterling*.—Twenty of these pence were to weigh an ounce; whence the penny became a weight as well as a coin. See STERLING and *PENNY-Weight*.

The penny sterling was long disused as a coin; and was scarce known, but as a money of account, containing the twelfth part of a shilling; but of late years it has been introduced into the British current coin.

PENNY, in ancient statutes, &c. is used for all silver money. And hence the *ward-penny*, *aver-penny*, *hundred-penny*, *tithing-penny*, and *brothal-penny*.

PENNY-Weight, a Troy weight, containing twenty-four grains; each grain weighing a grain of wheat gathered out of the middle of the ear, well dried. The name took its rise hence, that this was anciently the weight of one of our ancient silver pennies. See PENNY.

Twenty of these penny-weights make an ounce Troy.

PENRITH, an ancient town of the county of Cumberland in England, seated under a hill called *Penrith-Fell*, near the rivers Eamont and Lowther. It is a great thoroughfare for travellers; but has little other trade, except tanning, and a small manufacture of checks. Formerly it had a castle, but it is now in ruins. In the churchyard is a monument of great antiquity, consisting of two stone pillars 11 feet 6 inches high, and 5 in circumference in the lower part, which is rounded; the upper is square, and tapers to a point; in the square part is some fretwork, and the relievo of a cross; and on the interior side of one is the faint representation of some animal. Both these stones are mortised at their lower part into a round one: they are about 15 feet asunder, and the space between them is inclosed on each side with two very large but thin semicircular stones; so that there is left between pillar and pillar a walk of two feet in breadth. Two of these lesser stones are plain, the others have certain figures, at present scarcely intelligible. Not far from these pillars is another called the *giant's thumb*, five feet eight inches high, with an expanded head, perforated on both sides; from the middle the stone rises again into a lesser head, rounded at top; but no part has a tendency to the figure of a cross, being in no part mutilated. The pillars are said to have been set up in memory of Sir Owen Cæsarius, a famous warrior

rior buried here, who killed ſo many wild bears, which much infeſted this county, that the figures of bears, cut out in ſtone, on each ſide of his grave, were ſet there in remembrance of the execution he made among thoſe beaſts; and it is likewiſe ſaid his body extended from one pillar to the other. In the market-place there is a town-houſe of wood, beautified with bears climbing up a ragged ſtaff. There is a memorandum on the north ſide of the veſtry without, that, in 1598, 2266 perſons died here of the plague. There is a charity ſchool in this place for 20 boys, and another for 30 girls, maintained by 55l. a-year, by the ſacrament-money and pariſh-ſtock. In 1715 the Scotch Highlanders entered this town, and quartered in it for a night, in their way to Preſton, without doing much harm; but in the laſt rebellion, in 1745, they were, it is ſaid, very rapacious and cruel. Its handſome ſpacious church has been lately rebuilt, and the roof ſupported by pillars, whoſe ſhafts are of one entire reddiſh ſtone, dug out of a neighbouring quarry. On the eaſt part of the pariſh, upon the north bank of the river Eamont, there are two caves or grottoes, dug out of the ſolid rock, and ſufficient to contain 100 men. The paſſage to them is very narrow and dangerous; and it is poſſible that its perilous acceſs may have given it the name of *Iſis Parlis;* though the vulgar tell ſtrange ſtories of one Iſis, a giant, who lived there in former times, and, like Cacus of old, uſed to ſeize men and cattle, and draw them into his den to devour them. But it is highly probable, that theſe ſubterraneous chambers were made for a ſecure retreat in time of ſudden danger; and the iron gates, which were taken away not long ago, ſeem to confirm that ſuppoſition. The population in 1801 was nearly 4000. W. Long. 4. 43. N. Lat. 54. 35.

PENROSE, Thomas, was the ſon of the reverend Mr Penroſe, rector of Newbury, Berks, a man of high character and abilities, deſcended from an ancient Corniſh family, beloved and reſpected by all who knew him. Mr Penroſe, jun. being intended for the church, purſued his ſtudies with ſucceſs, at Chriſt-church, Oxon, until the ſummer of 1762, when his eager turn to the naval and military line overpowering his attachment to his real intereſt, he left his college, and embarked in the unfortunate expedition againſt Nova Colonia, in South America, under the command of Captain Macnamara. The iſſue was fatal. The Clive (the largeſt veſſel) was burnt; and though the Ambuſcade eſcaped (on board of which Mr Penroſe, acting as lieutenant of marines, was wounded), yet the hardſhips which he afterwards ſuſtained in a prize ſloop, in which he was ſtationed, utterly ruined his conſtitution. Returning to England with ample teſtimonials of his gallantry and good behaviour, he finiſhed, at Hertford College, Oxon, his courſe of ſtudies; and having taken orders, accepted the curacy of Newbury, the income of which, by the voluntary ſubſcription of the inhabitants, was conſiderably augmented. After he had continued in that ſtation about nine years, it ſeemed as if the clouds of diſappointment, which had hitherto overſhadowed his proſpects, and tinctured his poetical eſſays with gloom, were clearing away; for he was then preſented by a friend, who knew his worth and honoured his abilities, to a living worth near 500l. per annum. It came, however, too late; for the ſtate of Mr Penroſe's health was now ſuch as left little hope, except in the aſſiſtance of the waters of Briſtol. Thither he went; and there he died in 1779, aged 36 years. In 1768 he married Miſs Mary Slocock of Newbury, by whom he had one child, Thomas, who was educated at Winton College.

Mr Penroſe was reſpected for his extenſive erudition, admired for his eloquence, and equally beloved and eſteemed for his ſocial qualities. By the poor, towards whom he was liberal to his utmoſt ability, he was venerated to the higheſt degree. In oratory and compoſition his talents were great. His pencil was ready as his pen, and on ſubjects of humour had uncommon merit. To his poetical abilities the public, by their reception of his Flights of Fancy, &c. have given a favourable teſtimony.

PENRYN, a town of Cornwall, in England, ſeated on a hill at the entrance of Falmouth-haven by Pendennis caſtle. The inhabitants in 1801 exceeded 2000; and the ſtreets are broad and well paved. There are ſo many gardens and orchards in it, that it reſembles very much a town in a wood. It is well watered with rivulets, and has an arm of the ſea on each ſide of it, with a good cuſtomhouſe and quay, and other neat buildings. It drives a conſiderable trade in pilchards, and in the Newfoundland fiſhery. It was anciently governed by a portreeve; but James I. made it a corporation, conſiſting of a mayor, 11 aldermen, 12 common-councilmen, with a recorder, ſteward, &c. an office of record every three weeks, with a priſon, and power to try felons in their juriſdiction. And he granted, that the mayor and two aldermen ſhould be juſtices of the peace, and that they ſhould have a guildhall. There was once a monaſtery in this place, which was a cell to Kirton; and there are ſtill to be ſeen a tower, and part of the garden walls, the ruins of a collegiate church. It has neither church nor chapel, but belongs to the pariſh of Gluvias, a quarter of a mile off. It has ſent members to parliament ever ſince the firſt year of Queen Mary; and James II. granted it a new charter, whereby their election was veſted in the magiſtracy only; but it was never made uſe of, all the inhabitants that pay ſcot and lot, who are not much above 100, being the electors. Mr Rymer gives a very remarkable account how Penryn was once ſaved by a company of ſtrolling players. He ſays, that towards the latter end of the 16th century the Spaniards were landing to burn the town juſt as the players were ſetting Samſon upon the Philiſtines; which performance was accompanied with ſuch drumming and ſhouting, that the Spaniards thought ſome ambuſh was laid for them, and ſcampered back to their ſhips. Queen Elizabeth founded a free-ſchool in this place. W. Long. 4. 58. N. Lat. 50. 23.

PENSACOLA, a ſettlement in North America, ſituated at the mouth of a river on the gulf of Mexico. It was eſtabliſhed by the French, and ceded to Great Britain in 1763. Its firſt diſcoverer was Sebaſtian Cabot in 1497.

The year 1781, ſo eventful to Britain in many reſpects, was alſo remarkable for the reduction of Penſacola by the Spaniards under Don Bernardo Galvez. Great preparations for this expedition had been making at the Havannah; but it was for ſome time retarded by a dreadful hurricane which attacked the Spaniſh fleet, and by which four ſhips of the line, beſides others of inferior note, were loſt, together with the people on board, to the amount of more than 2000. By this diſaſter the remainder were obliged to put back to the Havannah to repair;

Pensacola. repair; but as soon as the fleet was again judged capable of putting to sea, an embarkation was made of near 8000 men, with Don Bernardo at their head, together with five ships of the line, who arrived at Pensacola on the 9th of March 1781. This force was soon augmented by ten ships of the line and six frigates; while General Campbell, the British governor, could oppose such a formidable armament with few more than 1000 men, consisting of some regulars and seamen, with the inhabitants. The entrance of the harbour, which was the principal object of defence, was guarded by two small armed vessels, but they were insufficient to second the batteries that had been erected for its protection; and these, without the assistance of some ships of force, were incapable of resisting a vigorous attack. Notwithstanding this prodigious odds, however, the Spaniards met with the most determined opposition. Every inch of ground was disputed with the greatest resolution. The harbour was not forced without the greatest difficulty, nor could the vessels be taken that defended it; the companies belonging to them, after setting them on fire, retired on shore.

The Spaniards, now in possession of the harbour, invested the place in form, and made their approaches in a cautious and regular manner; while, on the other hand, the besieged were no less active and vigilant in their own defence. Sallies were made occasionally with great success, at the same time that an uninterrupted fire was kept up in such a manner as not only greatly to annoy, but even to strike the besiegers with astonishment. This incensed the Spanish general the more, as he knew that the garrison could expect no relief, and therefore that all their efforts could only prolong the date of their surrender. The resistance was the more mortifying, as he was perfectly conscious of the bravery of his troops; and he had artillery fit, as his officers expressed themselves, "to be employed against Gibraltar." With all these advantages, however, so resolute was the defence of the garrison, that after the siege had continued for two months, very little hope could be entertained of its speedy termination. As they despaired therefore of making any effectual impression by means of their cannon, they erected a battery of mortars, with which they bombarded a redoubt that commanded the main avenue to the place; and in this they were favoured by an unexpected accident. On the 8th of May a shell burst open the door of the powder magazine under the redoubt, by which it was blown up, with the loss of near 100 men killed and wounded. Fortunately for the garrison, however, two flank-works still remained entire, from both which so heavy a fire was kept up, that though an assault was immediately given, the assailants were repulsed with great slaughter. This afforded leisure to the garrison to carry off the wounded men, with some of the artillery, and to spike up the rest. As the enemy, however, soon recovered themselves, and prepared for a general storm, it was thought proper to abandon the flank-works, and retire into the body of the place. The possession of these outworks, however, gave the enemy such advantages, that the place was no longer tenable. Their situation, on a rising ground, enabled them to command the battery opposite to their chief approach with small arms, and to single out the men at their guns. A capitulation therefore became absolutely necessary, which was obtained on honourable terms. The town, with the whole province of West Florida, was confirmed to the Spaniards by the treaty of 1783. W. Long. 87. 12. N. Lat. 30. 28.

Pensacola || Pensilvania.

PENSANCE, a town of Cornwall, in England, at the bottom of Mountsbay, about ten miles from the Land's End. It was burnt in 1595 by the Spaniards, who, with four galleys, surprised this part of the coast, and set fire to several villages and farms: but it was soon after rebuilt, made one of the coinage towns, and has now a considerable trade. It lies in the parish of Madern, noted for its restorative spring, very effectual in the cure of lameness as well as the cholic, &c. It is well built, and has many ships belonging to it. The population in 1801 exceeded 3000 souls. The shore abounds with lead, tin, and copper ore; the veins appear on the utmost extent of land at low-water mark.

PENSILES HORTI, *Hanging Gardens*, in antiquity. See BABYLON, N° 5.

PENSILVANIA, late one of the principal British colonies in North America, had its name from the famous Quaker William Penn, son of Sir William, commander of the English fleet in Oliver Cromwell's time, and in the beginning of Charles II.'s reign, who obtained a grant of it in the year 1679; is bounded on the east by Delaware bay and river, and the Atlantic ocean; on the north by the country of the Iroquois, or five nations; and on the south and west by Maryland. Its extent from north to south is about 200 miles; but its breadth varies greatly, from 15, and even less, to near 200.

The air in Pensilvania is sweet and clear. The fall, or autumn, begins about the 20th of October, and lasts till the beginning of December, when the winter sets in, which continues till March, and is sometimes extremely cold and severe; but the air is then generally dry and healthy. The river Delaware, though very broad, is often frozen over. From March to June, that is, in the spring, the weather is more inconstant than in the other seasons. In the months of July, August, and September, the heats would be almost intolerable, if they were not mitigated by frequent cool breezes. The wind during the summer is generally south-west; but in the winter blows for the most part from the north-west over the snowy frozen mountains and lakes of Canada, which occasions the excessive cold during that season. On the whole, the climate of this state differs not materially from that of Connecticut, except that on the west side of the mountains the weather is much more regular. The inhabitants never feel those quick transitions from cold to heat, by a change of the wind from north to south, as those so frequently experience who live eastward of the mountains and near the sea. The hot southwardly winds get chilled by passing over the long chain of Allegany mountains.

Longevity, when tolerably ascertained, is doubtless the truest mark of the healthiness of any country; but this state, which has not been settled above 100 years, is not sufficiently old to determine from facts the state of longevity. Among the people called Quakers, who are the oldest settlers, there are instances of longevity, occasioned by their living in the old cultivated counties, and the temperance imposed on them by their religion. There are fewer long-lived people among the Germans than among other nations, occasioned by their excess of labour and low diet. They live chiefly upon vegetables and

Penfilvania. and watery food, that affords too little nourifhment to repair the wafte of their ftrength by hard labour. Nearly one half of the children born in Philadelphia die under two years of age, and chiefly with a difeafe in the ftomach and bowels. Very few die at this age in the country.

As to the face of this country, towards the coaft, like the adjacent colonies, it is flat, but rifes gradually to the Apalachian mountains on the weft. As much as nearly one-third of this ftate may be called mountainous; particularly the counties of Bedford, Huntingdon, Cumberland, part of Franklin, Dauphin, and part of Bucks and Northampton, through which pafs, under various names, the numerous ridges and fpurs, which collectively form what we choofe to call, for the fake of clearnefs, *the great range of Allegany mountains*. There is a remarkable difference between the country on the eaft and weft fide of the range of mountains we have juft been defcribing. Between thefe mountains and the lower falls of the rivers which run into the Atlantic, not only in this, but in all the fouthern ftates, are feveral ranges of ftones, fand, earths, and minerals, which lie in the utmoft confufion. Beds of ftone, of vaft extent, particularly of limeftone, have their feveral layers broken in pieces, and the fragments thrown confufedly in every direction. Between thefe lower falls and the ocean is a very extenfive collection of fand, clay, mud, and fhells, partly thrown up by the waves of the fea, partly brought down by floods from the upper county, and partly produced by the decay of vegetable fubftances. The country weftward of the Allegany mountains, in thefe refpects, is totally different. It is very irregular, broken, and variegated, but there are no mountains; and when viewed from the moft weftern ridge of the Allegany, it appears to be a vaft extended plain. All the various ftrata of ftone appear to have lain undifturbed in the fituation wherein they were firft formed. The layers of clay, fand, and coal, are nearly horizontal. Scarcely a fingle inftance is to be found to the contrary. Every appearance, in fhort, tends to confirm the opinion, that the original cruft, in which the ftone was formed, has never been broken up on the weft fide of the mountains, as it evidently has been eaftward of them.

The chief rivers are three, Delaware, Sufquehanna, and Skoolkil. The Delaware, rifing in the country of the Iroquois, takes its courfe fouthward; and after dividing this province from that of New Jerfey, falls into the Atlantic ocean between the promontories or capes May and Henlopen, forming at its mouth a large bay, called from the river *Delaware Bay*. This river is navigable above 200 miles. The Sufquehanna rifes alfo in the country of the Iroquois, and running fouth through the middle of the province, falls into the bay of Chefapeake, being navigable a great way for large fhips. The Skoolkil has its fource in the fame country as the other two, and alfo runs fouth, almoft parallel to them; till at length, turning to the eaftward, it falls into the Delaware at the city of Philadelphia. It is navigable for boats above 100 miles. Thefe rivers, with the numerous creeks and harbours in Delaware bay, capable of containing the largeft fleets, are extremely favourable to the trade of this province.

As to the foil, produce, and traffic of Penfilvania, we refer the reader to the articles NEW-YORK and the JERSEYS, fince what is there faid on thofe heads is equally applicable to this province; and if there is any difference, it is on the fide of this province. They have fome rice here; but in no great quantities; and fome tobacco, but it is not equal to that of Virginia. From the premiums offered by the fociety of arts in London, it appears that the foil and climate of this province are looked upon as proper for the cultivation of fome fpecies of vines. The trade carried on from hence and the other colonies to the French and Dutch iflands and Surinam, was greatly to the difadvantage of Britain, and very deftructive to the fugar-colonies: for they take molaffes, rum, and other fpirits, with a great many European goods, from thefe foreigners; carrying them horfes, provifions, and lumber in return; without which the French could not carry on their fugar-manufactures to that advantage they do.

New York, the Jerfeys, and Penfilvania, were difcovered, with the reft of the continent of North America, in the reign of Henry VII. by Sebaftian Cabot, for the crown of England; but Sir Walter Raleigh was the firft adventurer that attempted to plant colonies on thefe fhores, in the reign of Queen Elizabeth; and, in honour of that princefs, gave all the eaftern coaft of North America the name of *Virginia*. Mr Hudfon, an Englifhman, failing to that part of the coaft which lies between Virginia and New England, in the beginning of the reign of James I. and being about to make a fettlement at the mouth of Hudfon's river, the Dutch gave him a fum of money to difpofe of his intereft in this country to them. In the year 1608 they began to plant it; and, by virtue of this purchafe, laid claim to all thofe countries which are now denominated *New York*, *New Jerfey*, and *Penfilvania*; but there remaining fome part of this coaft which was not planted by the Hollanders, the Swedes fent a fleet of fhips thither, and took poffeffion of it for that crown; but the Dutch having a fuperior force in the neighbourhood, compelled the Swedes to fubmit to their dominion, allowing them, however, to enjoy the plantations they had fettled. The Englifh not admitting that either the Dutch or Swedes had any right to countries firft difcovered and planted by a fubject of England, and part of them at that time poffeffed by the fubjects of Great Britain, under charter from Queen Elizabeth and King James I.; King Charles II. during the firft Dutch war in 1664, granted the countries of New York, the Jerfeys, and Penfilvania, of which the Dutch had ufurped the poffeffion, to his brother James duke of York; and Sir Robert Carr being fent over with a fquadron of men of war and land forces, and fummoning the Dutch governor of the city of New Amfterdam, now New York, to furrender, he thought fit to obey the fummons, and yield that capital to the Englifh: the reft of the places in the poffeffion of the Dutch and Swedes followed his example; and thefe countries were confirmed to the Englifh by the Dutch at the next treaty of peace between the two nations. The duke of York afterwards parcelled them out to under proprietors; felling, in particular, to William Penn the elder, in 1683, the town of Newcaftle, *alias* Delaware, and a diftrict of 12 miles round the fame; to whom, his heirs, and affigns, by another deed of the fame date, he made over all that tract of land from 12 miles fouth of Newcaftle to the Whore-hills, otherwife called *Cape Henlopen*, now divided into the two counties

Penſilvania. counties of Kent and Suſſex, which, with Newcaſtle diſtrict, are commonly known by the name of the *Three Lower Counties upon Delaware River.* All the reſt of the under-proprietors, ſome time after, ſurrendered their charters to the crown; whereby New York and the Jerſeys became royal governments; but Penn retained that part of the country which had been ſold to him by the duke of York, together with what had been granted to him before in 1680-1, which now conſtitutes the province of Penſilvania. As ſoon as Penn had got his patent, he began to plant the country. Thoſe who went over from England were generally Diſſenters and Quakers, whoſe religion is eſtabliſhed by law here, but with a toleration of all other Proteſtant ſects. The Dutch and Swedes, who were ſettled here before Mr Penn became proprietor, chooſing ſtill to reſide in this country, as they did in New York and the Jerſeys, obtained the ſame privileges as the reſt of his majeſty's ſubjects; and their deſcendants are now in a manner the ſame people with the Engliſh, ſpeaking their language, and being governed by their laws and cuſtoms. Mr Penn, however, not ſatisfied with the title granted him by King Charles II. and his brother, bought the lands alſo of the Indians for a valuable conſideration, or what they eſteemed ſuch (though 20 miles were purchaſed, at firſt, for leſs than an acre about Philadelphia would pay now), paying them in cloth, tools, and utenſils, to their entire ſatisfaction: for they had not hands to cultivate the hundredth part of their lands, and if they could have raiſed a product, there was nobody to buy: the purchaſe, therefore, was all clear gain to them; and, by the coming of the Engliſh, their paltry trade became ſo profitable, that they ſoon found their condition much altered for the better; and are now as well clothed and fed as the European peaſantry in many places.

Penſilvania is one of the moſt flouriſhing colonies in North America, having never had any quarrel with the natives. Whenever they deſire to extend their ſettlements, they purchaſe new lands of the ſachems, never taking any by force; but the Indians now ſet a very high price upon their lands, in compariſon of what they did at firſt, and will hardly part with them at any rate. In an eſtimate of the proprietary eſtate of the province, publiſhed above 40 years ago, we find, that the proprietaries, who alone can purchaſe lands here from the natives, had bought ſeven millions of acres for no more than 750l. ſterling, which the proprietaries afterwards ſold at the rate of 15l. for every 100 acres. The Indian council at Onandago, however, diſapproved of their deputies parting with ſo much land; and, in the year 1755, obliged the proprietaries to reconvey great part of the ſame to the Indians.

A diſpute ſubſiſted a long time between the proprietaries of this province and Lord Baltimore, proprietary of Maryland, about the right to certain lands; which was at laſt amicably adjuſted, though greatly in favour of the Penns.

About the year 1704 there happened ſome alteration in the conſtitution of the province. The eſtabliſhment that took place, and ſubſiſted till the American war broke out, conſiſted of a governor, council, and aſſembly, each with much the ſame power and privileges as in the neighbouring colony of New York. The lieutenant-governor and council were appointed by the proprietors Thomas and Richard Penn, with his majeſty's Penſilvania. approbation; but if the laws enacted here were not repealed within ſix months after they had been preſented to the king for his approbation or diſallowance, they were not repealable by the crown after that time.

By the preſent conſtitution of Penſilvania, which was eſtabliſhed in September 1776, all legiſlative powers are lodged in a ſingle body of men, which is ſtyled, *The general aſſembly of repreſentatives of the freemen of Penſilvania.* The qualification required to render a perſon eligible to this aſſembly is, two years reſidence in the city or county for which he is choſen. The qualifications of the electors are, full age, and one year's reſidence in the ſtate, with payment of public taxes during that time. But the ſons of freeholders are intitled to vote for repreſentatives, without any qualification except full age. No man can be elected as a member of the aſſembly more than four years in ſeven. The repreſentatives are choſen annually on the ſecond Tueſday in October, and they meet on the fourth Monday of the ſame month. The ſupreme executive power is lodged in a preſident, and a council conſiſting of a member from each county. The preſident is elected annually by the joint ballot of the aſſembly and council, and from the members of council. A vice-preſident is choſen at the ſame time. The counſellors are choſen by the freemen every third year; and having ſerved three years, they are ineligible for the four ſucceeding years. The appointments of one-third only of the members expire every year; by which rotation no more than one-third can be new members.

Manufactures of different kinds are numerous in this ſtate, and rapidly on the increaſe. There are 16 furnaces and 37 forges, the latter of which it is ſuppoſed, will prepare annually 6290 tons of iron. Here alſo they make every implement of huſbandry and kitchen utenſils. Penſilvania contains 52 mills for the manufacturing of paper, the annual product of which has been valued at 25,000 dollars. About 300,000 hats of wool and fur are annually made; and the mills for making gunpowder are 25 in number. Glauber's ſalts and ſal ammoniac have alſo begun to be manufactured of late to a conſiderable extent; and there are water-works near the falls of Trenton which grind grain, roll and ſlit iron, and pound gypſum or plaſter of Paris. The number of militia is eſtimated at upwards of 90,000. For people of almoſt every religious perſuaſion there are about 384 places of public worſhip. The expence of the government of this ſtate amounts to about 32,280l. ſterling annually.

With reſpect to population, Morſe informs us, that in 1787 the inhabitants in Penſilvania were reckoned at 360,000. It is probable they are now more numerous, perhaps 400,000. If we fix them at this, the population for every ſquare mile will be only nine; by which it appears that Penſilvania is only one-fifth as populous as Connecticut. But Connecticut was ſettled nearly half a century before Penſilvania; ſo that in order to do juſtice to Penſilvania in the compariſon, we muſt anticipate her probable population 50 years hence. By a cenſus taken in 1790, the population amounted to 434,000. Theſe inhabitants conſiſt of emigrants from England, Ireland, Germany, and Scotland. The Friends and Epiſcopalians are chiefly of Engliſh extraction, and compoſe about one third of the inhabitants. They live principally

Penfilvania. principally in the city of Philadelphia, and in the counties of Chefter, Philadelphia, Bucks, and Montgomery. The Irifh are moftly Prefbyterians. Their anceftors came from the north of Ireland, which was originally fettled from Scotland; hence they have been fometimes called Scotch Irifh, to denote their double defcent. But they are commonly and more properly called Irifh, or the defcendants of people from the north of Ireland. They inhabit the weftern and frontier counties, and are numerous. The Germans compofe one quarter at leaft, if not a third, of the inhabitants of Penfilvania. They inhabit the north parts of the city of Philadelphia, and the counties of Philadelphia, Montgomery, Bucks, Dauphin, Lancafter, York, and Northampton; moftly in the four laft. They confift of Lutherans (who are the moft numerous fect), Calvinifts, Moravians, Mennonifts, Tunkers (corruptly called Dunkers), and Swingfelters, who are a fpecies of Quakers. Thefe are all diftinguifhed for their temperance, induftry, and economy. The Germans have ufually 15 of 69 members in the affembly; and fome of them have arifen to the firft honours in the ftate, and now fill a number of the higher offices. Yet the lower clafs are very ignorant and fuperftitious. It is not uncommon to fee them going to market with a little bag of falt tied to their horfes manes, for the purpofe, they fay, of keeping off the witches.

The Baptifts (except the Mennonift and Tunker Baptifts, who are Germans) are chiefly the defcendants of emigrants from Wales, and are not numerous. A proportionate affemblage of the national prejudices, the manners, cuftoms, religions, and political fentiments of all thefe will form the Penfilvania character. As the leading traits in this character, thus conftituted, we may venture to mention induftry, frugality bordering in fome inftances on parfimony, enterprife, a tafte and ability for improvements in mechanics, in manufactures, in agriculture, in commerce, and in the liberal fciences; temperance, plainnefs, and fimplicity in drefs and manners; pride and humility in their extremes; inoffenfivenefs and intrigue; in regard to religion, variety and harmony; liberality, and its oppofites, fuperftition and bigotry; and in politics an unhappy jargon. Such appear to be the diftinguifhing traits in the collective Penfilvanian character.

Of the great variety of religious denominations in Penfilvania, the Friends or Quakers are the moft numerous. They were the firft fettlers of Penfilvania in 1682 under William Penn, and have ever fince flourifhed in the free enjoyment of their religion. They neither give titles nor ufe compliments in their converfation or writings, believing that *whatfoever is more than yea, yea, and nay, nay, cometh of evil*. They confcientioufly avoid, as unlawful, kneeling, bowing, or uncovering the head to any perfon. They difcard all fuperfluities in drefs or equipage; all games, fports, and plays, as unbecoming the Chriftian. *Swear not at all*, is an article of their creed literally obferved in its utmoft extent. They believe it unlawful to fight in any cafe whatever; and think that if their enemy *fmite them on the one cheek, they ought to turn to him the other alfo*. They are generally honeft, punctual, and even punctilious in their dealings; provident for the neceffities of their poor; friends to humanity, and of courfe enemies to flavery; ftrict in their difcipline; careful in the obfervance even of the punctilios in drefs, fpeech, and manners, which their religion enjoins; faithful in the education of their children; induftrious in their feveral occupations. In fhort, whatever peculiarities and miftakes thofe of other denominations have fuppofed they have fallen into, in point of religious doctrines, they have proved themfelves to be good citizens. Next to the Quakers, the Prefbyterians are the moft numerous. There are upwards of 60 minifters of the Lutheran and Calvinift religion, who are of German extraction, now in this ftate; all of whom have one or more congregations under their care; and many of them preach in fplendid and expenfive churches; and yet the firft Lutheran minifter, who arrived in Penfilvania about 40 years ago, was alive in 1787, and probably is ftill, as was alfo the fecond Calviniftical minifter. The Lutherans do not differ in any thing effential from the Epifcopalians, nor do the Calvinifts from the Prefbyterians.

The Moravians are of German extraction. Of this religion there are about 1300 fouls in Penfilvania, viz. between 500 and 600 in Bethlehem, 450 in Nazareth, and upwards of 300 at Litiz in Lancafter county. They call themfelves the *United Brethren of the Proteftant Epifcopal Church*. They are called *Moravians*, becaufe the firft fettlers in the Englifh dominions were chiefly migrants from Moravia. See HERNHUTTERS, and UNITAS *Fratrum*; and for the Mennonites, fee MENNONITES. They were introduced into America by Count Zinzendorff, and fettled at Bethlehem, which is their principal fettlement in America, as early as 1741. For the Tunkers, fee TUNKERS.

There are a great many literary, humane, and other ufeful focieties in Penfilvania; more it is faid, than in any of the United Provinces. There are feveral univerfities and colleges at Philadelphia and other places: See PHILADELPHIA. Lancafter, Carlifle, and Pittfburgh, are the chief towns after Philadelphia.

Penfilvania is divided into feven counties; four of which are called the *Upper*, and three the *Lower*. Of the Upper, viz. Buckingham, Philadelphia, Chefter, and Lancafter, the three firft are the lands included in King Charles II.'s grant, and defigned *Penfilvania*; the lower, viz. thofe of Newcaftle, Kent, and Suffex, were called *Nova Belgia* before the duke of York fold them, as we obferved above, to Mr Penn. The upper counties end at Marcus Hook, four miles below Chefter town, where the lower begin, and run along the coaft near 100 miles. Each of thefe counties had a fheriff, with a quarterly and monthly feffion, and affizes twice a year.

In the Philofophical Tranfactions for 1757, there is an account of a fpring in Penfilvania, which rifes from a copper mine, and yields 800 hogfheads in twenty-four hours. The water is of a pale green colour, of an acid, fweet, auftere, inky, and naufeous tafte. The faline matter which it holds in folution is probably fulphate of copper; for a piece of polifhed iron immerfed in it is foon covered with a cruft of metallic copper. It contains alfo, it is faid, copperas or fulphate of iron.

Among the other curiofities of this province may be reckoned another fpring, about 14 feet deep, and about 100 fquare in the neighbourhood of Reading. A full

mill

Penſilvania, Penſion. mill ſtream flows from it. The waters are clear, and full of fiſhes. From appearances it is probable that this ſpring is the opening or outlet of a very conſiderable river, which, a mile and a half or two miles above this place, ſinks into the earth, and is conveyed to this outlet in a ſubterranean channel. In the northern parts of Penſilvania there is a creek, called *Oil creek*, which empties into the Alleghany river. It iſſues from a ſpring, on the top of which floats an oil ſimilar to that called Barbadoes tar, and from which one man may gather ſeveral gallons in a day. The troops ſent to guard the weſtern poſts halted at this ſpring, collected ſome of the oil, and bathed their joints with it. This gave them great relief from the rheumatic complaints with which they were affected. The waters, of which the troops drank freely, operated as a gentle purge.

There are three remarkable grottoes or caves in this ſtate; one near Carliſle in Cumberland county; one in the townſhip of Durham, in Bucks county; and the other at Swetara in Lancaſter county. Of the two former there are no particular deſcriptions. The latter is on the eaſt bank of Swetara river, about two miles above its confluence with the Suſquehannah. Its entrance is ſpacious, and deſcends ſo much as that the ſurface of the river is rather higher than the bottom of the cave. The vault of this cave is of a ſolid limeſtone rock, perhaps 20 feet thick. It contains ſeveral apartments, ſome of them very high and ſpacious. The water is inceſſantly percolating through the roof, and falls in drops to the bottom of the cave. Theſe drops petrify as they fall, and have gradually formed ſolid pillars, which appear as ſupports to the roof. Thirty years ago there were ten ſuch pillars, each ſix inches in diameter, and ſix feet high; all ſo ranged that the place they encloſed reſembled a ſanctuary in a Roman church. No royal throne ever exhibited more grandeur than this *luſus naturæ*. The reſemblances of ſeveral monuments are found indented in the walls on the ſides of the cave, which appear like the tombs of departed heroes. Suſpended from the roof is *the bell* (which is nothing more than a ſtone projected in an unuſual form), ſo called from the ſound that it occaſions when ſtruck, which is ſimilar to that of a bell. Some of the ſtalactites are of a colour like ſugar-candy, and others reſemble loaf ſugar; but their beauty is much defaced by the country people. The water, which percolates through the roof, ſo much of it as is not petrified in its courſe, runs down the declivity, and is both pleaſant and wholeſome to drink. There are ſeveral holes in the bottom of the cave, deſcending perpendicularly, perhaps into an abyſs below, which renders it dangerous to walk without a light. At the end of the cave is a pretty brook, which, after a ſhort courſe, loſes itſelf among the rocks. Beyond this brook is an outlet from the cave by a very narrow aperture. Through this the vapours continually paſs outwards with a ſtrong current of air, and aſcend, reſembling at night the ſmoke of a furnace. Part of theſe vapours and fogs appear on aſcending to be condenſed at the head of this great alembic, and the more volatile parts to be carried off, through the aperture communicating with the exterior air before mentioned, by the force of the air in its paſſage.

PENSION, a ſum of money paid annually for ſervices or conſiderations already paſt. The yearly payment of each member to the houſes of the inns of courts are likewiſe named *penſions*; and the yearly aſſembly of the ſociety of Gray's Inn, to conſult on the affairs of the houſe, is alſo called a *penſion*. Penſion ‖ Penſioner.

PENSIONARY, or PENSIONER, a perſon who has an appointment or yearly ſum, payable during life, by way of acknowledgement, charged on the eſtate of a prince, company, or particular perſon.

Grand PENSIONARY, an appellation formerly given to the firſt miniſter of the ſtates of Holland. The grand penſionary was chairman in the aſſemblies of the ſtates of that province; he propoſed the matters to be conſulted on; collected the votes; formed and pronounced the reſolutions of the ſtates; opened letters; conferred with foreign miniſters, &c. His buſineſs was alſo to inſpect the finances, to maintain the authority of the ſtates, and to ſee that the laws were obſerved; and he was perpetual deputy of the ſtates general of the United Provinces. His commiſſion was, however, only given him for five years; after which it was deliberated whether or not it ſhould be renewed; but there was no inſtance of its being revoked; therefore death only put an end to the functions of this important miniſter.

PENSIONARY was alſo the firſt miniſter of the regency of each city in Holland. His office was to give his advice in affairs relating to the government, either of the ſtate in general, or of the city in particular; and in aſſemblies of the ſtates of the province, he was ſpeaker in behalf of his city. The function, however, of theſe penſionaries was not everywhere alike; in ſome cities they only gave their advice, and were never found in aſſemblies of the magiſtrates, except when expreſsly called hither: in others they attended conſtantly; and in others they made the propoſitions on the part of the burgomaſters, drew up their concluſions, &c. They were called *penſionaries*, becauſe they received an appointment or penſion.

PENSIONER, in general, denotes a perſon who receives a penſion, yearly ſalary, or allowance. Hence,

The Band of Gentlemen PENSIONERS, the nobleſt ſort of guard to the king's perſon, conſiſts of 40 gentlemen, who receive a yearly penſion of 100l.

This honourable band was firſt inſtituted by King Henry VIII. and their office is to attend the king's perſon, with their battle-axes, to and from his chapel royal, and to receive him in the preſence chamber, or coming out of his privy lodgings; they are alſo to attend at all great ſolemnities, as coronations, St George's feaſt, public audiences of ambaſſadors, at the ſovereign's going to parliament, &c.

They are each obliged to keep three double horſes and a ſervant, and ſo are properly a troop of horſe. They wait half at a time quarterly; but on Chriſtmas-day, Eaſter-day, Whitſunday, &c. and on extraordinary occaſions, they are all obliged to give their attendance. They have likewiſe the honour to carry up the ſovereign's dinner on the coronation-day and St George's feaſt; at which times the king or queen uſually confer the honour of knighthood on two ſuch gentlemen of the band as their captain preſents.

Their arms are gilt battle-axes; and their weapons, on horſeback, in time of war, are cuiraſſiers arms, with ſword and piſtols. Their ſtandard in time of war is, argent, a croſs gules. Their captain is always a noble-man,

Pensioner || Pentagraph.

man, who has under him a lieutenant, a standard-bearer, a clerk of the check, secretary, paymaster, and harbinger.

PENSIONER, in the university of Cambridge and in that of Dublin, has a very peculiar meaning; for those students, either under graduates or bachelors of arts, are called *pensioners* who live wholly at their own expence, and who receive no emolument whatever from the college of which they are members. They are divided into two kinds, the *greater* and the *less*; the former of which are generally called *fellow-commoners*, because they eat with the fellows of their college; the latter are always called *pensioners*, and eat with the scholars, who are those students of the college, either under-graduates or bachelors who are upon the foundation, who receive emoluments from the society, and who are capable of being elected fellows. See SERVITOR and SIZAR.

PENSTOCK, a sluice or flood-gate, serving to retain or let go at pleasure the water of a mill-pond, or the like.

PENTACHORD (compound of πεντε, *five*, and χορδη, *string*), an ancient musical instrument with five strings. The invention of the pentachord is referred to the Scythians; the strings were of bullocks leather, and they were struck with a plectrum made of goats horn.

PENTACROSTIC, in *Poetry*, a set of verses so disposed, as that there are always five acrostics of the same name, in five divisions of each verse. See ACROSTIC.

PENTADACTYLON, FIVE FINGERS, in *Botany*, a name given by some authors to the *ricinus* or *palma Christi*, from the figure of its leaf.

PENTADACTYLOS PISCIS, the *five fingered fish*, the trivial name of a fish common in all the seas of the East Indies, and called by the Dutch there *viif vinger visch*.

PENTAGON, in *Geometry*, a figure of five sides and five angles. See GEOMETRY.

In fortification, pentagon denotes a fort with five bastions.

PENTAGRAPH, PANTOGRAPH, or PANTOGRAPHER, an instrument designed for drawing figures in what proportion you please, without any skill in the art.

The instrument is otherwise called a *parallelogram*. The following is the description of this instrument by Mr Adams.

Geomet. and Graphic Essays, p. 374.

"It is an instrument (says Mr Adams) as useful to the experienced draftsman, as to those who have made but little progress in the art. It saves a great deal of time, either in reducing, enlarging, or copying of the same size, giving the outlines of any drawing, however crooked or complex, with the utmost exactness; nor is it confined to any particular kind, but may with equal facility be used for copying figures, plans, sea-charts, maps, profiles, landscapes, &c.

"*Description and use of the Pantographer.*—I have not been able to ascertain who was the inventor of this useful instrument. The earliest account I find is that of the Jesuit Scheiner, about the year 1631, in a small tract entitled *Pantographice, sive ars nova delineandi*. The principles are self-evident to every geometrician; the mechanical construction was first improved and brought to its present state of perfection by *my father*, about the year 1750. It is one, among many other scientific improvements and inventions completed by him, that others have ingloriously, and many years after, assumed to themselves.

Pentagraph.

"The pantographer is usually made of wood, or brass, and consists of four flat rules, two of them long, and two short. The two longest are joined at the end A, by a double pivot, which is fixed to one of the rules, and works in two small holes placed at the end of the other. Under the joint is an ivory castor, to support this end of the instrument. The two smaller rules are fixed by pivots at E and H, near the middle of the larger rules, and are also joined together at their other end, G.

Plate CCCCIX.

By the construction of this instrument, the four rules always form a parallelogram. There is a sliding box on the longer arm, and another on the shorter arm. These boxes may be fixed at any part of the rules by means of their milled nuts; each of these boxes is furnished with a cylindric tube, to carry either the tracing point or crayon or fulcrum.

The fulcrum or support K, is a leaden weight inclosed in a mahogany box, on this the instrument moves when in use; there are two moveable rollers, to support and facilitate the motions of the pantographer, their situation may be varied as occasion requires.

The graduations are placed on two of the rules, on each of them are two scales, the fiducial edges of the boxes are to be set to these, according to the work to be performed by the instrument.

"The crayon, the tracer, and fulcrum, must in all cases be in a right line, so that when they are set, if a string be stretched over them, and they do not coincide with it, there is an error either in the setting or graduations.

"The long tube which carries the pencil or crayon, moves easily up or down another tube; there is a string affixed to the long or inner tube, passing afterwards through the holes in the three small knobs to the tracing point, where it may, if necessary, be fastened. By pulling this string, the pencil is lifted up occasionally, and thus prevented from making false or improper marks upon the copy.

"*To use this instrument when the copy is to be of the same size as the original.*—Place the instrument upon a large table, and set the sliding boxes B and D, to the divisions marked 12. Put the crayon into the box B, place the box D upon the fulcrum or leaden foot; the tracing point at C. Then lay a piece of paper under the crayon, and the original drawing under the tracer, and move the tracing point over the principal strokes of the original, and the crayon will form the required copy.

"*To reduce a drawing, &c. to half the size of the original.*—Set the boxes B and D, to the divisions marked one-half, place the fulcrum at B, the crayon at D, and tracer at C.

"*To reduce a drawing, &c. to less than one-half the original.*—Suppose one-third, one-fourth, one-fifth, &c. Place the fulcrum at B, crayon at D, and tracer at C, and slide the boxes B and D, to the divisions marked one-third, one-fourth, one-fifth, &c. *on the longer scales.* It may be proper to observe here, that if the copy be less

Pentagraph || Pentapolis.

less than one-half the original, or when it is required greater than the original, the longer scales are to be used.

"*For greater than one-half the original drawing.*—Suppose it be required to make a drawing, two-thirds, three-fourths, four-fifths, &c. Set the boxes B and D, to corresponding divisions, as two-thirds, three-fourths, four-fifths, &c. *on the shorter scales*, place the fulcrum at D, the crayon at B, and tracer at C.

"*When the original drawing is to be enlarged.*—Suppose one-eighth, one-sixth, &c. set the boxes B and D, to one-eighth, one-sixth, &c. *on the longer scales*, place the fulcrum at D, the crayon at C, and tracer at B.

"*Where the copy is required of a size differing from the fractional parts laid down on the instrument.*—For this purpose there are two scales laid down, containing 100 unequal parts, one scale numbered from 10 to 80, the other from 50 to 100.

"*If the copy is to be under one-half the original size*, place the boxes B and D, to any two corresponding divisions under 50, the fulcrum at B, and crayon at D.

"*If the copy is to be larger than one-half the original*, place the boxes B and D, to corresponding divisions between 50 and 100; the fulcrum at B, and crayon at D.

"*To change the situation of the pantographer.*—Copy first as much as the pantographer will take in; then make three points on the original, and as many corresponding points on the copy. Then remove the fulcrum to another situation, but so, that when the tracing point is applied to the three points marked on the original, the crayon may exactly coincide with the other three points on the copy, and proceed as before; and so on for every change in the situation of your instrument, and by this means a pantographer of two feet and a half in length will copy a drawing of any size whatsoever.

PENTAMETER, in ancient poetry, a kind of verse, consisting of five feet, or metres, whence the name. The two first feet may be either dactyls or spondees at pleasure; the third is always a spondee; and the two last anapestes: such is the following verse of Ovid.

1 2 3 4 5

Carmini|bus vi|ves tem|pus in om|ne meis.

A pentameter verse subjoined to an hexameter, constitutes what is called *elegiac*. See ELEGIAC.

PENTANDRIA (from πεντε, *five*, and ανηρ, *a man* or *husband*); the name of the fifth class in Linnæus's sexual method, consisting of plants which have hermaphrodite flowers, with five stamina or male organs. See BOTANY *Index*.

PENTAPETALOUS, an appellation given to flowers which consist of five petals or leaves.

PENTAPETES, a genus of plants belonging to the monadelphia class, and in the natural method ranking under the 37th order, *Columniferæ*. See BOTANY *Index*.

PENTAPOLIS. This name is given to the five cities, Sodom, Gomorrah, Adamah, Zeboim, and Zoar (Wisdom x. 6.). They were all five condemned to utter destruction, but Lot interceded for the preservation of Zoar, otherwise called *Bala*. Sodom, Gomorrah, Adamah, and Zeboim, were all consumed by fire from heaven, and in the place where they stood was made the lake Asphaltites, or the lake of Sodom.

Pentapolis, Pentateuch.

PENTAPOLIS (Ptolemy), a district of Cyrenaica; situated on the Mediterranean; denominated from its five cities; namely, Berenice, Arsinoe, Ptolemais, Cyrene, and Apollonia.

PENTAPOLIS *of the Philistines*, (Josephus); taking name from five principal cities, Gaza, Gath, Ascalon, Azotus, and Ekron.

PENTATEUCH. This word, which is derived from the Greek Πενταπευχος, from πεντε, *five*, and τευχος, an *instrument* or *volume*, signifies the collection of the five instruments or books of Moses, which are Genesis, Exodus, Leviticus, Numbers, and Deuteronomy: each of which books we have given an account of under their several names.

There are some modern critics who have disputed Moses's right to the pentateuch. They observe that the author speaks always in the third person. "Now the man Moses was very meek above all the men which were upon the face of the earth. The Lord spake unto Moses, saying, &c. Moses said to Pharaoh, &c." Thus they think he would never have spoken of himself; but would at least sometimes have mentioned himself in the first person. Besides this, say they, the author of the pentateuch sometimes abridges his narration like a writer who collected from some ancient memoirs. Sometimes he interrupts the thread of his discourse; for example, he makes Lamech the bigamist to say (Gen. iv. 23.), "Hear my voice, ye wives of Lamech, hearken unto my speech; for I have slain a man to my wounding, and a young man to my hurt," without informing us before-hand to whom this is related. These observations, for example (Gen. xii. 6.), "And the Canaanite was then in the land," cannot be reconciled to the age of Moses, since the Canaanites continued to be the masters of Palestine all the time of Moses. The passage out of the book of the wars of the Lord, quoted in the book of Numbers (xxi. 14.) seems to have been clapped in afterwards, as also the first verses of Deuteronomy. The account of the death of Moses, which is at the end of the same book, cannot certainly belong to this legislator; and the same judgment may be made of other passages, wherein it is said, that the places mentioned lay beyond Jordan; that the bed of Og was at Ramah to this day; that the havoth of Jair, or the cities of Jair, were known to the author, though probably they had not that name till after Moses's time (Numb. xxxii. 41. Deut. iii. 14.).

It is observed also in the text of the Pentateuch, that there are some places that are defective; for example, in Exodus (xii. 8.), we see Moses speaking to Pharaoh, where the author omits the beginning of his discourse. The Samaritan inserts in the same place what is wanting in the Hebrew. In other places, the same Samaritan copy adds what is deficient in the Hebrew text; and what it contains more than the Hebrew seems so well connected with the rest of the discourse, that it would be difficult to separate them. Lastly, they believe that they observe certain strokes in the pentateuch which can hardly agree with Moses, who was born and bred in Egypt; as what he says of the earthly paradise, of the rivers that watered it, and ran through it; of the cities of Babylon, Erech, Resen, and Calneh; of the

gold

Pentateuch ‖ Penthorum.

gold of Pison, of the bdellium, of the stone of Sohem, or onyx-stone, which was to be found in that country. These particulars, observed with such curiosity, seem to prove, that the author of the pentateuch lived beyond the Euphrates. Add what he says concerning the ark of Noah, of its construction, of the place where it rested, of the wood wherewith it was built, of the bitumen of Babylon, &c. But in answer to all these objections, we may observe in general, from an eminent writer* of our own country, that these books are by the most ancient writers ascribed to Moses; and it is confirmed by the authority of heathen writers themselves, that they are of his writing: besides this, we have the unanimous testimony of the whole Jewish nation, ever since Moses's time, from the first writing of them. Divers texts of the pentateuch imply that it was written by Moses; and the book of Joshua, and other parts of scripture, import as much; and though some passages have been thought to imply the contrary, yet this is but a late opinion, and has been sufficiently confuted by several learned men. The Samaritans receive no other scriptures but the pentateuch, rejecting all the other books which are still in the Jewish canon.

* *Jenkin's Reasonableness of Christianity.*

PENTATHLON, in antiquity, a general name for the five exercises performed at the Grecian games, viz. wrestling, boxing, leaping, running, and playing at the discus.

PENTECOST, a solemn festival of the Jews; so called, because it was celebrated on the 50th day after the 16th of Nisan, which was the second day of the passover. The Hebrews called it *the feast of weeks*, because it was kept seven weeks after the passover. They then offered the first fruits of the wheat harvest, which was then completed: besides which they presented at the temple seven lambs of that year, one calf, and two rams, for a burnt offering; two lambs for a peace offering; and a goat for a sin offering (Levit. xxiii. 15, 16. Exod. xxxiv. 22. and Deut. xvi. 9, 10.). The feast of the pentecost was instituted among the Israelites, first to oblige them to repair to the temple of the Lord, there to acknowledge his absolute dominion over the whole country, and to offer him the first-fruits of their harvest; and, secondly, that they might call to mind, and give thanks to God, for the law which he had given them from Mount Sinai, on the 50th day after their coming out of Egypt.

The modern Jews celebrate the pentecost for two days. They deck the synagogue and their own houses with garlands of flowers. They hear a sermon or oration in praise of the law, which they suppose to have been delivered on this day. The Jews of Germany make a very thick cake, consisting of seven layers of paste, which they call *Sinai*. The seven layers represent the seven heavens, which they think God was obliged to reascend from the top of this mountain. See *Leo of Modena* and *Buxtorf's synag. Jud.*

It was on the feast of pentecost that the Holy Ghost miraculously descended on the apostles of our Lord, who were assembled together after his ascension in a house at Jerusalem (Acts ii.).

PENTHESILEA, queen of the Amazons, succeeded Orythia, and gave proofs of her courage at the siege of Troy, where she was killed by Achilles. Pliny says that she invented the battle-axe.

PENTHORUM, in *Botany*, a genus of the pentagynia order, belonging to the pentandria class of plants. The calyx is quinquefid; there are either five petals or none; the capsule is five-pointed and quinquelocular.

Penthorum ‖ Pepin.

PENTLAND, or PICTLAND FRITH, is a narrow strait of six miles between the mainland of Scotland and the Orkney isles. This strait is the great thoroughfare of shipping between the eastern and western seas, the terror of mariners, and has been the grave of thousands. The navigation of this frith was formerly extremely dangerous by the island of Stroma, and two rocks called the *Skerries*, lying near the middle of it; but it is now greatly improved, and comparatively safe, in consequence of a lighthouse erected on the Skerries.

PENULA, among the ancient Romans, was a coarse garment or cloak worn in cold or rainy weather. It was shorter than the lacerna, and therefore more proper for travellers. It was generally brown, and succeeded the toga after the state became monarchical. Augustus abolished the custom of wearing the penula over the toga, considering it as too effeminate for Romans; and the ædiles had orders to suffer none to appear in the circus or forum with the lacerna or penula. Writers are not agreed as to the precise difference between these two articles of dress; but we are told that they were chiefly worn by the lower orders of people. See LACERNA.

PENULTIMA, or *PENULTIMATE Syllable*, in *Grammar*, denotes the last syllable but one of a word; and hence the antepenultimate syllable is the last but two, or that immediately before the penultima.

PENUMBRA, in *Astronomy*, a partial shade observed between the perfect shadow and the full light in an eclipse. It arises from the magnitude of the sun's body: for were he only a luminous point, the shadow would be all perfect; but, by reason of the diameter of the sun, it happens, that a place which is not illuminated by the whole body of the sun, does yet receive rays from a part thereof.

PEON, in the language of Hindostan, means a foot soldier, armed with sword and target. In common use it is a footman, so armed, employed to run before a palanquin. *Piaadah* is the proper word; from which *peon* is a corruption.

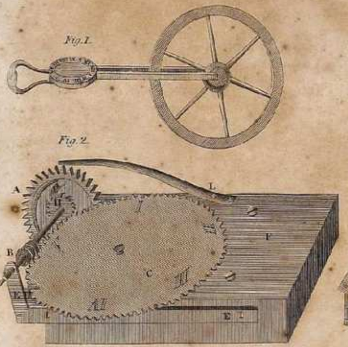
PEOR, a famous mountain beyond Jordan, which Eusebius places between Heshbon and Livias. The mountains Nebo, Pisgah, and Peor, were near one another, and probably made but the same chain of mountains. It is very likely that Peor took its name from some deity of the same name, which was worshipped there; for Peor, Phegor, or Baal-peor, was known in this country. See Numb. xxv. 3. Deut. iv. 3. Psal. cv. 28.

PEOR, was a city of the tribe of Judah, which is not read in the Hebrew, nor in the Vulgate, but only in the Greek of the Septuagint (Josh. xv. 60.). Eusebius says it was near Bethlehem, and Jerome adds, that in his time it was called *Paora*.

PEPIN LE HERISTAL, or LE GROS, mayor of the palace under Clovis III. Childebert, and Dagobert. The power of these mayors in France was so great, that they left the sovereign only the empty title, and in the end seized on the throne itself.

PEPIN le Bref, or *le Petit*, grandson to Pepin the Gros, and first king of the second race of French monarchs,

PERAMBULATOR.



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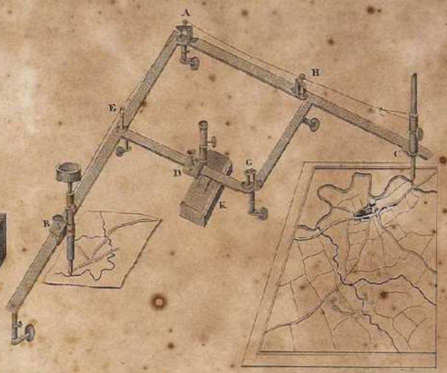

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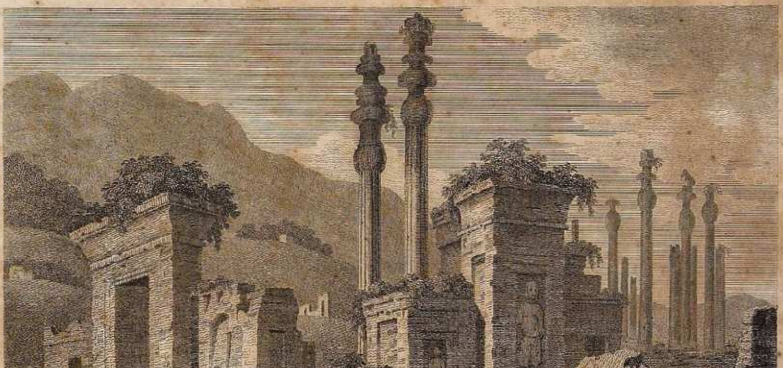


Engraved by Wm D. Lizars Edinr

narchis, was mayor of the palace to Childeric III. a weak prince: he contrived to confine him and his ſon Thierri in different monaſteries; and then, with the aſſiſtance of Pope Stephen III. he uſurped the ſovereign power. He died in 768, aged 54.

PEPLIS, a genus of plants belonging to the hexandria claſs, and in the natural method ranking under the 17th order, *Calycanthemæ*. See BOTANY *Index*.

PEPLUS, a long robe worn by the women in ancient times, reaching down to the feet, without ſleeves, and ſo very fine, that the ſhape of the body might be ſeen through it. The Athenians uſed much ceremony in making the peplus, and dreſſing the ſtatue of Minerva with it. Homer makes frequent mention of the peplus of that goddeſs.

PEPPER, PIPER, in *Natural Hiſtory*, an aromatic berry of a hot quality, chiefly uſed in ſeaſoning. We have three kinds of pepper at preſent uſed in the ſhops, the black, the white, and the long pepper.

Black pepper is the fruit of the piper, and is brought from the Dutch ſettlements in the Eaſt Indies. See PIPER, BOTANY *Index*.

The common white pepper is factitious, being prepared from the black in the following manner: they ſteep this in ſea-water, expoſed to the heat of the ſun for ſeveral days, till the rind or outer bark looſens; they then take it out, and, when it is half dry, rub it till the rind falls off; then they dry the white fruit, and the remains of the rind blow away like chaff. A great deal of the heat of the pepper is taken off by this proceſs, ſo that the white kind is more fit for many purpoſes than the black. However, there is a ſort of native white pepper produced on a ſpecies of the ſame plant; which is much better than the factitious, and indeed little inferior to the black.

The long pepper is a dried fruit, of an inch or an inch and a half in length, and about the thickneſs of a large gooſe quill: it is of a browniſh gray colour, cylindrical in figure, and ſaid to be produced on a plant of the ſame genus.

Pepper is principally uſed by us in food, to aſſiſt digeſtion: but the people in the Eaſt Indies eſteem it as a ſtomachic, and drink a ſtrong infuſion of it in water by way of giving them an appetite: they have alſo a way of making a fiery ſpirit of fermented freſh pepper with water, which they uſe for the ſame purpoſes. They have alſo a way of preſerving the common and long pepper in vinegar, and eating them afterwards at meals.

Jamaica PEPPER, or *Pimento*. See LAURUS, BOTANY *Index*.

PEPPER-*Mint*. See MENTHA, BOTANY and MATERIA MEDICA *Index*.

PEPPER-*Pot*. See CAPSICUM, BOTANY *Index*.

PEPPER-*Water*, a liquor prepared in the following manner, for microſcopical obſervations: Put common black pepper, groſsly powdered, into an open veſſel ſo as to cover the bottom of it half an inch thick, and put to it rain or river water, till it covers it an inch; ſhake or ſtir the whole well together at the firſt mixing, but never diſturb it afterwards: let the veſſel be expoſed to the air uncovered; and in a few days there will be ſeen a pellicle or thin ſkin ſwimming on the ſurface of the liquor, preſenting ſeveral [illegible].

This is a congeries of multitudes of ſmall animals;

and being examined by the microſcope, will be ſeen all in motion: the animals, at firſt ſight, are ſo ſmall as not to be diſtinguiſhable, unleſs to the greateſt magnifiers; but they grow daily till they arrive at their full ſize. Their numbers are alſo continually increaſing, till the whole ſurface of the liquor is full of them, to a conſiderable depth. When diſturbed, they will ſometimes all dart down to the bottom; but they ſoon after come up to the ſurface again. The ſkin appears ſooneſt in warm weather, and the animals grow the quickeſt: but in the ſevereſt cold it will ſucceed, unleſs the water freezes.

About the quantity of a pin's head of this ſcum, taken up on the nib of a new pen, or the tip of a hair-pencil, is to be laid on a plate of clear glaſs; and if applied firſt to the third magnifier, then to the ſecond, and finally to the firſt, will ſhow the different animalcules it contains, of ſeveral kinds and ſhapes as well as ſizes.

PEPPERMINT-TREE. See EUCALYPTUS, BOTANY *Index*.

PERA, one of the ſuburbs of Conſtantinople, where ambaſſadors and Chriſtians uſually reſide. See CONSTANTINOPLE.

PERAMBULATOR, in ſurveying, an inſtrument for meaſuring diſtances, called alſo *odometer, pedometer, way-wiſer*, and *ſurveying-wheel*.

It conſiſts of a wheel AA, fig. 1. two feet ſeven inches and a half in diameter; conſequently half a pole, or eight feet three inches, in circumference. On one end of the axis is a nut, three quarters of an inch in diameter, and divided into eight teeth; which, upon moving the wheel round, fall into the eight teeth of another nut *c*, fixed on one end of an iron-rod Q, and thus turn the rod once round in the time the wheel makes one revolution. This rod, lying along a groove in the ſide of the carriage of the inſtrument, under the dotted line, has at its other end a ſquare hole, into which is fitted the end *b* of a ſmall cylinder P. This cylinder is diſpoſed under the dial-plate of a movement, at the end of the carriage B, in ſuch a manner as to be moveable about its axis: its end *a* is cut into a perpetual ſcrew, which falling into the 32 teeth of a wheel perpendicular thereto, upon driving the inſtrument forward, that wheel makes a revolution each 16th pole. On the axis of this wheel is a pinion with ſix teeth, which falling into the teeth of another wheel of 60 teeth, carries it round every 160th pole, or half a mile. (Plate CCCCIX. fig. 1.)

This laſt wheel, carrying a hand or index round with it over the diviſions of a dial-plate, whoſe outer limb is divided into 160 parts, correſponding to the 160 poles, points out the number of poles paſſed over. Again, on the axis of this laſt wheel is a pinion, containing 20 teeth, which falling into the teeth of a third wheel which hath 40 teeth, drives it once round in 320 poles, or a mile. On the axis of this wheel is a pinion of 12 teeth, which, falling into the teeth of a fourth wheel having 72 teeth, drives it once round in 12 miles.

This fourth wheel, carrying another index over the inner limb of the dial-plate, divided into 12 for miles, and each mile ſubdivided into halves, quarters, and furlongs, ſerves to regiſter the revolutions of the other hand, and to keep account of the half miles and miles paſſed over as far as 12 miles.

The uſe of this inſtrument is obvious from its conſtruction. Its proper office is in the ſurveying of roads

Perambulator. and large distances, where a great deal of expedition, and not much accuracy, is required. It is evident, that driving it along and observing the hands, has the same effect as dragging the chain and taking account of the chains and links.

Its advantages are its hardiness and expedition; its contrivance is such, that it may be fitted to the wheel of a coach, in which state it performs its office, and measures the road without any trouble at all.

The following is a description of an instrument invented by Mr Edgeworth for the same purpose.

"This odometer," says Mr Edgeworth, "is more simple than any which I have seen, is less liable to be out of order, and may be easily attached to the axle-tree bed of a post-chaise, gig, or any other carriage.

"One turn and a half of a screw is formed round the nave of one of the hinder wheels by a slip of iron three quarters of an inch broad and one-eighth of an inch thick; this is wound round the nave, and fastened to it by screws passing through five or six cocks, which are turned up at right angles on the slip of iron. The helix so formed on the nave of the carriage wheel acts as a worm or screw upon the teeth of the wheel A, fig. 2. (Fig. 2.) upon the arbor of which another screw of brass B is formed, which acts upon the brass wheel C. This wheel C serves also as a dial-plate, and is divided into miles, halves, quarters, and furlongs; the figures indicating the miles are nearly three quarters of an inch long, so as to be quite distinct; they are pointed out by the index D, which is placed as represented in the plate, in such a manner as to be easily seen from the carriage.

"These two brass wheels are mounted by the irons EE upon a block of wood F, eight inches long, two inches thick; and five inches broad. This block may be screwed upon the axle-tree-bed by two strong square-headed wood screws. If the carriage permits, this block should be fixed obliquely on the axle-tree-bed, so that the dial-plate may be raised up toward the eye of the person looking out from the carriage.

"H is a ratchet wheel attached to the arbor of the wheel A, which, by means of the click I, allows the wheel to be set with a key or handle fitted to the squared end of the arbor at K. L is a long spring screwed on the block; it presses on the wheel A, to prevent it from shaking by the motion of the carriage. A small triangular spring is put under the middle of the dial-plate wheel for the same purpose.

"If the wheel of the carriage is exactly five feet three inches in circumference, the brass-toothed wheel which it turns should have twenty teeth, and that which serves as a dial-plate should have eighty; it will then count five miles. If the carriage wheel is either larger or smaller, a mile should be carefully measured on a smooth road, and the number of turns which the carriage wheel makes in going this mile may easily be counted by tying a piece of fine packthread to one of the spokes, and letting the wheel, as it moves slowly forward, wind up the packthread on its nave. When the wheel has proceeded a half or a quarter of a mile, unwind the string and count the number of turns which it has made.

"By the addition of another wheel of eighty-one teeth placed under the dial-plate wheel, and moved by the screw C, with a proper hand fitted to it, and proper figures on the dial-plate, this machine would count four hundred miles*."

* Nich. Jour. 15. 81.

It has been supposed that the ancient Romans were acquainted with an instrument of this kind. The foundation of this opinion is an expression of Julius Capitolinus in his life of the emperor Pertinax. The words are, "*Et alia (vehicula), iter metientia, et horas monstrantia.*" "Carriages for measuring the length of the road, and marking the time of the journey."

Perambulator ‖ Perception.

PERCA, the PERCH; a genus of fishes belonging to the order of thoracici. See ICHTHYOLOGY *Index*.

PERCEPTION, is a word which is so well understood, that it is difficult for the lexicographer to give any explanation of it. It has been called the first and most simple act of the mind by which it is conscious of its own ideas. This definition, however, is improper, as it confounds perception with consciousness; although the objects of the former faculty are things without us, those of the latter the energies of our own minds. Perception is that power or faculty by which, through the medium of the senses, we have the cognizance of objects distinct and apart from ourselves, and learn that we are but a small part in the system of nature. By what process the senses give us this information, we have endeavoured to show elsewhere, (see METAPHYSICS, Part I. chap. i.); and we should not again introduce the subject, but to notice a singular opinion of a very able writer, whose work has been given to the public since our article alluded to had issued from the press.

Dr Sayers has endeavoured to prove that no man can perceive two objects, or be conscious of two ideas at the same instant. If this be true, not only our theory of time (see METAPHYSICS, Part II. chap. vii.) is grossly absurd, but even memory itself seems to be an imaginary faculty. If a man be not conscious of his present existence, at the very instant when he thinks of a past event, or reviews a series of past transactions, it is difficult, to us indeed impossible, to conceive what idea he can have of time, or what he can mean when he says that he remembers a thing. But let us examine the reasoning by which the ingenious author endeavours to establish his opinion.

"If we reflect (says he†) upon the surprising velocity with which ideas pass through the mind, and the remarkable rapidity with which the mind turns itself, or is directed from one object of contemplation to another, this might alone give us some suspicion that we may probably be mistaken in supposing ideas to be synchronously perceived. Other arguments may be adduced to strengthen this suspicion. It will be granted, I believe, that the mind, whether immaterial or the result of organization, has certainly a wholeness or unity belonging to it, and that it is either not composed of parts, or that no one of the parts from which it originates is itself mind: in this case, it is difficult to conceive how two ideas should be impressed upon the mind at the same instant: for this would be supposing that part of the mind could receive one idea, and part another, at the same time; but if the parts do not perceive singly, this is evidently impossible. If, on the other hand, this self-division of the mind does not take place, then if two ideas are nevertheless to be perceived at the same instant, it would seem that those ideas must be so blended with each other, that neither of them could appear distinct. If we examine the manner in which a complex idea is perceived, we shall find very clearly, that the whole of such an idea is never present to the mind at once. In thinking of a centaur, for instance,

† *Disquisitions Metaphysical and Literary.*

Perception.

ſtance, can we at the ſame moment be thinking of the parts of a man and the parts of a horſe? Can we not almoſt detect the gliding of the mind from the one to the other? In contemplating the complex idea of gold, are the ideas of its colour, ductility, hardneſs, and weight, all preſent to the mind at the ſame inſtant? I think, if we accurately attended to it, we ſhall find a perceptible time has elapſed before this complex idea has been perfectly formed in our mind: but if all the parts of a complex idea cannot be recalled at the ſame inſtant, is it not reaſonable to infer that theſe parts are alſo ſingly impreſſed, and not all originally perceived at the ſame inſtant?"

This reaſoning is plauſible, but perhaps not convincing. Surely we have all been conſcious of bodily pain or pleaſure with our eyes open, and been offended by diſagreeable ſmells at the very inſtant that we looked at objects beautifully coloured. That our ideas paſs through the mind with great velocity, and that the mind can rapidly turn itſelf from one ſubject of contemplation to another, are truths which cannot be controverted; but inſtead of leading us to ſuppoſe that two or more objects cannot be ſynchronouſly perceived, or two or more ideas ſynchronouſly apprehended, they appear to furniſh a complete proof of the reverſe of all this. For we beg leave to aſk how we come to know that ideas paſs with velocity through the mind, if we be not all the while conſcious of ſomething that is permanent? If we can contemplate but one idea at once, it is plainly impoſſible that two or more can be compared together; and therefore we cannot poſſibly ſay that any particular train has paſſed through the mind with a degree of velocity greater or leſs than that which we have uſually experienced; nay, we cannot ſay that we have ever experienced a train of ideas at all, or even been conſcious of a ſingle idea, beſides the immediate object of preſent apprehenſion. That the mind is an individual, we moſt readily grant; but that it ſhould therefore be incapable of having *two* ideas ſynchronouſly excited in it, is a propoſition for which the author has brought no evidence. That it is difficult to conceive *how* this is done, we acknowledge; but not that it is more difficult than to conceive how a *ſingle* idea is excited in the mind; for of the mode in which mind and matter mutually operate on each other, we can form no conception. We know that objects make an impreſſion on the organs of ſenſe; that this impreſſion is by the nerves communicated to the brain, and that the agitation of the brain excites ſenſation in the mind: but in *what way* it excites ſenſation we know not; and therefore have no reaſon to ſuppoſe that two or more different agitations may not excite two or more ſynchronous ſenſations, as well as one agitation excites one ſenſation. That the agitation given to the brain operates on the mind, is known by experience; but experience gives us no information reſpecting the *mode* of that operation. If the mind be, as our author and we ſuppoſe, one individual, it cannot, as mind, be either diviſible or extended; and therefore it is certain that the operation in queſtion cannot be, in the proper ſenſe of the word, impreſſion. Hence we have no right to infer, if two objects be perceived at once, either that the idea of the one muſt be impreſſed on a part of the mind different from that which receives the impreſſion of the other, or that the two impreſſions muſt be ſo blended with each other, that neither of them could appear diſtinct; for this would be to reaſon from one mode of operation to another; with which, upon acknowledged principles, it can have nothing in common.

Perception ‖ Perche.

By far the greater part of our ideas are relicts of *viſible* ſenſations; and of every thing which we can actually ſee at once, we at once contemplate the idea. That we could at once perceive a centaur, if ſuch a being were preſented to us, cannot ſurely be doubted by any one who has ever looked at a man on horſeback; and therefore that we can at the ſame moment contemplate the whole idea of a centaur, is a fact of which conſciouſneſs will not permit us to doubt.—If, indeed, we chooſe to analyze this complex idea into its component parts, it is ſelf evident that the mind muſt glide from the one to the other, becauſe the very analyſis conſiſts in the ſeparation of the parts, of which, if after that proceſs we think of them, we muſt think in ſucceſſion: but that we may have at the ſame inſtant, either an actual or ideal view of all the parts of the centaur united, is a propoſition ſo evident as to admit of no other proof than an appeal to experience. In contemplating what the author calls the complex idea of gold, it cannot be denied that the ideas of its colour, ductility, hardneſs, and weight, are never all preſent to the mind at the ſame inſtant: but the reaſon is obvious. Theſe are not all *ideas*, in the proper ſenſe of the word, but ſome of them are ideas, and ſome notions, acquired by very different proceſſes and very different faculties. Colour is an idea of ſenſation, immediately ſuggeſted through the organ of ſight; ductility is a relative notion, acquired by repeated experiments; and gold might be made the object of every ſenſe, without ſuggeſting any ſuch notion. The writer of this article never ſaw an experiment made on the ductility of gold, and has therefore a very obſcure and indiſtinct notion of that property of the metal; but he is conſcious, that he can perceive, at the ſame inſtant, the yellow colour and circular figure of a guinea, and have a very diſtinct, though relative notion, of its hardneſs.

We conclude, therefore, that the mind is capable of two or more ſynchronous perceptions, or ſynchronous ideas; that during every train which paſſes through it, it is conſcious of its own permanent exiſtence; and that if it were limited to the apprehenſion of but one idea at once, it could have no remembrance of the paſt, or anticipation of the future, but would appear to itſelf, could it make any compariſon, to paſs away like a flaſh of lightning.

PERCH, in land-meaſuring, a rod or pole of $16\frac{1}{2}$ feet in length, of which 40 in length and 4 in breadth make an acre of ground. But, by the cuſtoms of ſeveral counties, there is a difference in this meaſure. In Staffordſhire it is 24 feet; and in the foreſt of Sherwood 25 feet, the foot being there 18 inches long; and in Herefordſhire a perch of ditching is 21 feet, the perch of walling $16\frac{1}{2}$ feet, and a pole of denſhiered ground is 12 feet, &c.

PERCH, a fiſh. See PERCA, ICHTHYOLOGY *Index*.

PERCHE, a territory of Orleannois in France, 35 miles long, and 30 broad; bounded on the north by Normandy; on the ſouth, by Maine and Dunois; on the eaſt, by Beauce; and on the weſt, by Maine. It takes its name from a foreſt, and is pretty fertile. The inhabitants carry on a pretty good trade; and the principal town is Belleſme.

PERCOLATION, a chemical operation which is the ſame with FILTRATION.

PERCUSSION, in *Mechanics*, the impreſſion a body makes in falling or ſtriking upon another; or the ſhock of two bodies in motion. See DYNAMICS and MECHANICS.

PERDICIUM, a genus of plants, belonging to the ſyngeneſia claſs; and in the natural method ranking under the 49th order, *Compoſitæ*. See BOTANY *Index*.

PERDIX, the partridge. See TETRAO, ORNITHOLOGY *Index*.

PEREASLAW, a ſtrong populous town of Poland, in the palatinate of Kiovia, ſituated on the river Tribecz; in E. Long. 32. 44. N. Lat. 49. 46.

PERENNIALS, or PERENNIAL FLOWERS, in *Botany*, a term applied to thoſe plants whoſe roots abide many years, whether they retain their leaves in winter or not. Thoſe which retain their leaves are called *ever-greens*; but ſuch as caſt their leaves are named *deciduous* or *perdifols*.

PERFECT, ſomething to which nothing is wanting, or that has all the requiſites of its nature and kind.

PERFECT Cadence, in *Muſic*. See CADENCE.

PERFECT Tenſe, in *Grammar*. See PRETERITE.

PERFECTION, the ſtate or quality of a thing PERFECT.

Perfection is divided, according to Chauvinus, into phyſical, moral, and metaphyſical.

Phyſical or natural perfection, is that whereby a thing has all its powers and faculties, and thoſe too in full vigour; and all its parts both principal and ſecondary, and thoſe in their due proportion, conſtitution, &c. in which ſenſe man is ſaid to be perfect when he has a ſound mind in a ſound body. This perfection is by the ſchools frequently termed *ἐνεργητικὴ*, becauſe a thing is enabled thereby to perform all its operations.

Moral perfection is an eminent degree of virtue or moral goodneſs, to which men arrive by repeated acts of piety, beneficence, &c. This is uſually ſubdivided into abſolute or inherent, which is actually in him to whom we attribute it; and imputative, which exiſts in ſome other, and not in him it is attributed to.

Metaphyſical, tranſcendental, or eſſential perfection, is the poſſeſſion of all the eſſential attributes, or of all the parts neceſſary to the integrity of a ſubſtance; or it is that whereby a thing has or is provided of every thing belonging to its nature. This is either abſolute, where all imperfection is excluded, ſuch is the perfection of God; or *ſecundum quid*, and in its kind.

PERFORANS MANUS.
PERFORANS Pedis.
PERFORATUS MANUS.
PERFORATUS Pedis.
} See ANATOMY, *Table of the Muſcles*.

PERFUME, denotes either the volatile effluvia from any body affecting the organ of ſmelling, or the ſubſtance emitting thoſe effluvia; in which laſt ſenſe the word is moſt commonly uſed. The generality of perfumes are made up of muſk, ambergris, civet, roſe and cedar woods, orange-flowers, jeſſamines, jonquils, tuberoſes, and other odoriferous flowers. Thoſe drugs commonly called aromatics, ſuch as ſtorax, frankincenſe, benzoin, cloves, mace, &c. enter the compoſition of a

perfume; ſome are alſo compoſed of aromatic herbs or leaves, as lavender, marjoram, ſage, thyme, hyſſop, &c.

The uſe of perfumes was frequent among the Hebrews, and among the orientals in general, before it was known to the Greeks and Romans. In the time of Moſes perfumes muſt have been known in Egypt, ſince he ſpeaks of the art of the perfumer, and gives the compoſition of two kinds of perfumes (Exod. xxx. 25.), of which one was to be offered to the Lord upon the golden altar which was in the holy place; and the other was appointed for the anointing of the high prieſt and his ſons (*ibid.* 34, &c.) as alſo of the tabernacle, and all the veſſels that were uſed in divine ſervice.

The Hebrews had alſo perfumes which they made uſe of in embalming their dead. The compoſition is not known, but it is certain that they generally made uſe of myrrh, aloes, and other ſtrong and aſtringent drugs, proper to prevent putrefaction (John xix. 49.). See the article EMBALMING.

Beſides the perfumes for theſe purpoſes, the Scripture mentions other occaſions whereon the Hebrews uſed perfumes. The ſpouſe in the Canticles (i. 3.) commends the ſcent of the perfumes of her lover; and her lover in return ſays, that the ſcent of the perfumes of his ſpouſe ſurpaſſes the moſt excellent odours (*id.* iv. 10—14.). He names particularly the ſpikenard, the calamus, the cinnamon, the myrrh, and the aloes, as making a part of theſe perfumes. The voluptuous woman deſcribed by Solomon (Prov. vii. 17.) ſays, that ſhe had perfumed her bed with myrrh, aloes, and cinnamon. The epicures in the book of Wiſdom (ii. 7.) encourage one another to the luxuriant uſe of odours and coſtly perfumes.

Iſaiah (lvii. 9.) reproaches Judea, whom he deſcribes as a ſpouſe faithleſs to God, with being painted and perfumed to pleaſe ſtrangers, "Thou wenteſt to the king with ointment, and didſt increaſe thy perfumes." Ezekiel (xxiii. 41.) ſeems to accuſe the Jews with having profaned the odours and perfumes, the uſe of which was reſerved to ſacred things, by applying them to their own uſe.

They came afterwards to be very common among the Greeks and Romans, eſpecially thoſe compoſed of muſk, ambergris, and civet. The *nardus* and *malobathrum* were held in much eſtimation, and were imported from Syria. The *unguentum nardinum* was variouſly prepared, and contained many ingredients. *Malobathrum* was an Indian plant. Perfumes were alſo uſed at ſacrifices to regale the gods; at feaſts, to increaſe the pleaſures of ſenſation; at funerals, to overpower cadaverous ſmells, and pleaſe the manes of the dead; and in the theatres, to prevent the offenſive effluvia, proceeding from a crowd, from being perceived.

Since people are become ſenſible of the harm they do to the head, perfumes are generally diſuſed among us; however, they are ſtill common in Spain and Italy.

PERGAMA, (Virgil), the citadel of Troy; which, becauſe of its extraordinary height, gave name to all high buildings (Servius). Others ſay the walls of Troy were called *Pergama*.

PERGAMUM, (Pliny); called alſo *Pergamea*, (Virgil); *Pergamia*, (Plutarch; a town of Crete,

Pergamum. Pergamus. built by Agamemnon in memory of his victory, (Velleius). Here was the burying-place of Lycurgus (Aristoxenus, quoted by Plutarch). It was situated near Cydonia (Servius); to what point not said: but Scylax helps him out, who places the Dactynnean temple of Diana, which stood near Cydonia (Strabo), to the north of the territory of Pergamia.—Another PERGAMUM (Pliny, Strabo); a town of Mysia, situated on the Caïcus, which runs by it. It was the royal residence of Eumenes, and of the kings of the Attali (Livy). There an ancient temple of Æsculapius stood; an asylum (Tacitus). The ornament of Pergamum was the royal library, vying with that of Alexandria in Egypt; the kings of Pergamum and Egypt rivalling each other in this respect (Pliny). Strabo ascribes this rivalry to Eumenes. Plutarch reckons up 200,000 volumes in the library at Pergamum. Here the *membranæ pergamenæ*, whence the name *parchment*, were invented for the use of books, (Varro, quoted by Pliny). The country of Galen, and of Oribasius chief physician to Julian the Apostate (Eunapius), called by some the *ape of Galen*. Here P. Scipio died (Cicero). Attalus son of Eumenes dying without issue, bequeathed his kingdom to the Roman people, who reduced it to a province, (Strabo). *Pergameus*, the epithet (Martial). Here was one of the nine *conventus juridici*, or assemblies of the *Asia Romana*, called *Pergamenus*, and the ninth in order (Pliny); which he also calls *jurisdictio Pergamena*.

PERGAMUS, an ancient kingdom of Asia, formed out of the ruins of the empire of Alexander the Great. It commenced about the year 283 B. C. The first sovereign was one Philetærus an eunuch, by birth a Paphlagonian, of a mean descent, and in his youth a menial servant to Antigonus one of Alexander's captains. He afterwards served Lysimachus king of Macedon and Thrace, who appointed him keeper of his treasures lodged in Pergamus. While he held this employment, having fallen under the displeasure of Arsinoe wife to Lysimachus, she found means to make a quarrel between him and his master; upon which Philetærus seized on the castle of Pergamus, together with the treasures entrusted to his care, amounting to 90,000 talents. At first he offered his service, together with his treasure, to Seleucus king of Syria: but both Seleucus and Lysimachus dying soon after, he kept possession of the town and treasure also till his death; which happened 20 years after his revolt from Lysimachus.

Philetærus left the city of Pergamus to his brother, or, according to some, to his brother's son Eumenes I. and he, laying hold of the opportunity offered by the dissensions among the Seleucidæ, possessed himself of many strong-holds in the province of Asia; and having hired a body of Galatians, defeated Antiochus, as he was returning from a victory gained over his brother Seleucus Callinicus. By this victory he obtained possession of the greater part of Asia: however, he did not long enjoy his acquisitions; for he died next year of immoderate drinking, a vice to which he was greatly addicted.

Eumenes was succeeded by Attalus I. nephew of Philetærus, and the first who took upon him the title of king of Pergamus. He defeated the Gauls, who were desirous of settling in his territory; and, according to Livy, was the first of the Asiatic princes who refused to pay a contribution to these barbarians. Pergamus. When Seleucus Ceraunus was engaged in other wars, he invaded his territories, and conquered all the provinces on this side of Mount Taurus; but was soon driven out of his new acquisitions by Seleucus and his grandfather Achæus, who entering into an alliance against him, deprived him of all his newly acquired territories, and even besieged him in his capital. Upon this Attalus invited to his assistance the Gauls who had settled in Thrace: and with their help not only obliged the enemy to raise the siege of Pergamus, but quickly recovered all the provinces he had lost. After this he invaded Ionia and the neighbouring provinces, where several cities voluntarily submitted to him. The Teians, Colophonians, with the inhabitants of Egea and Lemnos, sent deputies declaring themselves ready to acknowledge him for their sovereign; the Carsenes, on the other side the river Lycus, opened their gates to him, having first expelled the governor set over them by Achæus. From thence he advanced to Apia, and encamping on the banks of the river Megithus, received homage from the neighbouring nations. But here the Gauls being frightened by an eclipse of the moon, refused to proceed farther; which obliged Attalus to return to the Hellespont, where he allowed his allies to settle, giving them a large and fruitful territory, and promising that he would always assist and protect them to the utmost of his power.

Attalus having thus settled his affairs with equal honour and advantage to himself, entered into an alliance with Rome, and afterwards joined them in their war against Philip king of Macedon. Here he had the command of the Rhodian fleet; with which he not only drove the Macedonians quite out of the seas, but having landed his men, he, in conjunction with the Athenians, invaded Macedon, and obliged Philip to raise the siege of Athens, which he had greatly distressed; for which services the Athenians not only heaped on him all the favours they could, but called one of their tribes by his name; an honour they had never bestowed on any foreigner before.

Attalus, not contented with all he had yet done against Philip, attempted to form a general confederacy of the Greeks against him. But while he was haranguing the Bœotians to this purpose, and exhorting them with great vehemence to enter into an alliance with the Romans against their common enemy, he fell down speechless. However, he came to himself again, and desired to be carried by sea from Thebes to Pergamus, where he died soon after his arrival, in the 72d year of his age and 43d of his reign.

This prince was a man of great generosity, and such an enthusiast in learning and learned men, that he caused a grammarian named *Daphidas* to be thrown into the sea from the top of a high rock, because he spoke disrespectfully of Homer.

Attalus was succeeded by his eldest son Eumenes II. He was exceedingly attached to the Romans, insomuch that he refused the daughter of Antiochus the Great in marriage, lest he should thus have been led into a difference with that people. He also gave notice to the Roman senate of the transactions of Ariarathes king of Cappadocia, who was making great preparations both by sea and land. Nor did Eumenes stop here; for when

Pergamus. when he faw the war about to break out between Antiochus and the Romans, he fent his brother Attalus to Rome to give information of the proceedings of Antiochus. The fenate heaped honours both on Eumenes and his brother; and in the war which followed, gave the command of their fleet to the king of Pergamus in conjunction with C. Livius Salinator. The victory gained on this occafion was in a great meafure owing to Eumenes, who boarded fome of the enemy's fhips in perfon, and during the whole action behaved with uncommon bravery. Some time afterwards Eumenes, entering the territories of Antiochus with a body of 5000 men, ravaged all the country about Thyatira, and returned with an immenfe booty. But in the mean time Antiochus invading Pergamus in his turn, ravaged the whole country, and even laid fiege to the capital. Attalus, the king's brother, held out with a handful of men till the Achæans, who were in alliance with Eumenes, fent 1000 foot and 100 horfe to his affiftance. As this fmall body of auxiliaries were all chofen men, and commanded by an experienced officer, they behaved with fuch bravery that the Syrians were obliged to raife the fiege. At the battle of Magnefia, too, Eumenes behaved with the greateft bravery: not only fuftaining the firft attack of the enemy's elephants, but driving them back again on their own troops, which put the ranks in diforder, and gave the Romans an opportunity of giving them a total defeat by attacking them oppertunely with their horfe. In confequence of this defeat, Antiochus was obliged to conclude a peace with the Romans on fuch terms as they pleafed to prefcribe; one of which was, that he fhould pay Eumenes 400 talents, and a quantity of corn, in recompenfe for the damage he had done him.

Eumenes now thought of obtaining fome reward from the Romans equivalent to the fervices he had done them. Having gone to Rome, he told the fenate, that he was come to beg of them that the Greek cities which had belonged to Antiochus before the commencement of the late war, might now be added to his dominions; but his demand was warmly oppofed by the ambaffadors from Rhodes, as well as by deputies from all the Greek cities in Afia. The fenate, however, after hearing both parties, decided the matter in favour of Eumenes, adding to his dominions all the countries on this fide of Mount Taurus which belonged to Antiochus; the other provinces lying between that mountain and the river Mæander, excepting Lycia and Caria, were beftowed on the Rhodians. All the cities, which had paid tribute to Attalus, were ordered to pay the fame to Eumenes; but fuch as had been tributary to Antiochus were declared free.

Soon after this Eumenes was engaged in a war with Prufias king of Bithynia, who made war upon him by the advice of Hannibal the celebrated Carthaginian general. But Eumenes, being affifted by the Romans, defeated Prufias in an engagement by fea, and another by land; which fo difheartened him, that he was ready to accept of peace on any terms. However, before the treaty was concluded, Hannibal found means to draw Philip of Macedon into the confederacy, who fent Philocles, an old and experienced officer, with a confiderable body of troops to join Prufias. Hereupon Eumenes fent his brother Attalus to Rome with a golden crown, worth 15,000 talents, to complain of Prufias for making war on the allies of the Roman people without any provocation. The fenate accepted the prefent, and promifed to adjuft every thing to the fatisfaction of their friend Eumenes, whom they looked upon to be the moft fteady ally they had in Afia. But in the mean time Prufias, having ventured another fea-fight, by a contrivance of Hannibal's gained a complete victory. The Carthaginian commander advifed him to fill a great many earthen veffels with various kinds of ferpents and other poifonous reptiles, and in the heat of the fight to throw them into the enemies fhips fo as to break the pots and let the ferpents loofe. All the foldiers and feamen were commanded to attack the fhip in which Eumenes was, and only to defend themfelves as well as they could againft the reft; and that they might be in no danger of miftaking the fhip, a herald was fent before the engagement with a letter to the king. As foon as the two fleets drew near, all the fhips of Prufias, fingling out that of Eumenes, difcharged fuch a quantity of ferpents into it, that neither foldiers nor failors could do their duty, but were forced to fly to the fhore, left they fhould fall into the enemy's hands. The other fhips, after a faint refiftance, followed the king's example, and were all driven afhore with great flaughter, the foldiers being no lefs annoyed by the ftings of the ferpents, than by the weapons of the enemy. The greateft part of the fhips of Eumenes were burnt, feveral taken, and the others fo much fhattered that they became quite unferviceable. The fame year Prufias gained two remarkable victories over Eumenes by land, both of which were entirely owing to ftratagems of Hannibal. But, while matters were thus going on to the difadvantage of Eumenes, the Romans interfered, and by their deputies not only put an end to the differences between the two kings, but prevailed on Prufias to betray Hannibal; upon which he poifoned himfelf, as hath been related under the article HANNIBAL.

Eumenes being thus freed from fuch a dangerous enemy, engaged in a new war with the kings of Cappadocia and Pontus, in which alfo he proved victorious. His friendfhip for the Romans he carried to fuch a degree of enthufiafm, that he went in perfon to Rome to inform them of the machinations of Perfes king of Macedon. He had before quarrelled with the Rhodians, who fent ambaffadors to Rome to complain of him. But as the ambaffadors happened to arrive while the king himfelf was prefent in the city, the Rhodian ambaffadors could not obtain any hearing, and Eumenes was difmiffed with new marks of favour. This journey, however, had almoft proved fatal to him; for, on his return, as he was going to perform a facrifice at Delphi, two affaffins, fent by Perfes, rolled down two great ftones upon him as he entered the ftraits of the mountains. With one he was dangeroufly wounded on the head, and with the other on the fhoulder. He fell with the blows from a fteep place, and thus received many other bruifes; fo that he was carried on board his fhip when it could not well be known whether he was dead or alive. His people, however, foon finding that he was ftill alive, conveyed him to Corinth, and from Corinth to Ægina, having caufed their veffels to be carried over the ifthmus.

Eumenes remained at Ægina till his wounds were cured,

Pergamus. cured, which was done with ſuch ſecrecy, that a report of his death was ſpread all over Aſia, and even believed at Rome; nay, his brother Attalus was ſo convinced of the truth of this report, that he not only aſſumed the government, but even married Stratonice the wife of Eumenes. But in a ſhort time Eumenes convinced them both of his being alive, by returning to his kingdom. On the receipt of this news, Attalus reſigned the ſovereignty in great haſte, and went to meet his brother; carrying a halberd, as one of his guards. Eumenes received both him and the queen with great tenderneſs, nor did he ever ſay any thing which might tend to make them uneaſy; only it is ſaid he whiſpered in his brother's ear when he firſt ſaw him, "Be in no haſte to marry my wife again till you are ſure that I am dead."

The king being now more than ever exaſperated againſt Perſes, joined the Romans in their war againſt him; but during the courſe of it he ſuddenly cooled in his affection towards thoſe allies whom he had hitherto ſerved with ſo much zeal, and that to ſuch a degree, that he admitted ambaſſadors from Perſes, and offered to ſtand neuter if he would pay him 1000 talents, and for 1500, to influence the Romans to grant him a ſafe and honourable peace. But theſe negociations were broke off without effect, by reaſon of the diſtruſt which the two kings had of one another. Eumenes could not truſt Perſes unleſs he paid him the money beforehand; while, on the other hand, Perſes did not care to part with the money before Eumenes had performed what he promiſed; neither could he be induced to pay the ſum in queſtion, though the king of Pergamus offered to give hoſtages for the performance of his promiſe. What the reaſon of ſuch a ſudden change in the diſpoſition of Eumenes was, is nowhere told; however, the fact is certain. The negociations above mentioned were concealed from the Romans as long as poſſible; but they ſoon came to be known: after which the republic began to entertain no ſmall jealouſy of their old friend, and therefore heaped favours on his brother Attalus, without taking any notice of the king himſelf. Eumenes had ſent him to Rome to congratulate the ſenate on the happy iſſue of the war with Perſes, not thinking that his practices had been diſcovered. However, the ſenate without taking any notice of their diſaffection to Eumenes at firſt, entertained Attalus with the greateſt magnificence; then ſeveral of the ſenators who viſited him proceeded to acquaint him with their ſuſpicions of the king, and deſired Attalus to treat with them in his own name, aſſuring him, that the kingdom of Pergamus would be granted him, if he demanded it, by the ſenate. Theſe ſpeeches had at firſt ſome effect; but Attalus, being of an honeſt diſpoſition, and aſſiſted by the advice of a phyſician called *Stratius*, a man of great probity, reſolved not to comply with their deſire. When he was admitted to the ſenate, therefore, he firſt congratulated them on the happy iſſue of the Macedonian war, then modeſtly recounted his own ſervices; and laſtly, acquainted them with the motive of his journey; intreated them to ſend ambaſſadors to the Gauls, who by their authority might ſecure his brother from any danger of their hoſtilities; and he requeſted them alſo, that the two cities of Ænus and Maronea might be beſtowed on himſelf. The ſenate, imagining that Attalus deſigned to chooſe ſome other day to ſue for his brother's kingdom, not only granted all his requeſts, but ſent him richer and more magnificent preſents than they had ever done before. Upon this Attalus immediately ſet out on his return to Pergamus; which ſo provoked the ſenators, that they declared the cities free which they had promiſed to Attalus, thus rendering ineffectual their promiſe which they were aſhamed openly to revoke; and as for the Gauls, who were on all occaſions ready to invade the kingdom of Pergamus, they ſent ambaſſadors to them, with inſtructions to behave in ſuch a manner as would rather tend to encourage them in their deſign than diſſuade them from it. Pergamus.

Eumenes, being alarmed at thoſe proceedings, reſolved to go in perſon to Rome, in order to juſtify himſelf. But the ſenate having already condemned him in their own minds, reſolved not to hear his vindication. For this reaſon, as ſoon as they heard of his deſign, they made an act that no king ſhould be permitted to enter the gates of Rome. Eumenes, however, who knew nothing of this act, ſet forward on his journey, and landed at Brunduſium; but no ſooner did the Roman ſenate get intelligence of his arrival there, than they ſent a quæſtor acquainting him with the decree of the ſenate; and telling him at the ſame time, that if he had any buſineſs to tranſact with the ſenate, he was appointed to hear it, and tranſmit it to them; but if not, that the king muſt leave Italy without delay. To this Eumenes replied, that he had no buſineſs of any conſequence to tranſact, and that he did not ſtand in need of any of their aſſiſtance; and without ſaying a word more, went on board his ſhip, and returned to Pergamus.

On his return home, the Gauls, being encouraged by the cold reception which he had met with at Rome, invaded his territories, but were repulſed with great loſs by the king, who afterwards invaded the dominions of Pruſias, and poſſeſſed himſelf of ſeveral cities. This produced new complaints at Rome; and Eumenes was accuſed, not only by the ambaſſadors of Pruſias, but alſo by thoſe of the Gauls and many cities in Aſia, of keeping a ſecret correſpondence with Perſes king of Macedon. This laſt charge was confirmed by ſome letters which the Romans themſelves had intercepted; ſo that Eumenes found it impoſſible to keep up his credit any longer at Rome, though he ſent his brothers Athenæus and Attalus thither to intercede for him. The ſenators, in ſhort, had conceived the moſt implacable hatred againſt him, and ſeemed abſolutely bent on his deſtruction, when he died, in the 39th year of his reign, leaving his kingdom and his wife to his brother Attalus. He left one ſon, but he was an infant, and incapable of governing the kingdom; for which reaſon Eumenes choſe rather to give the preſent poſſeſſion of the crown to his brother, reſerving the ſucceſſion to his ſon, than to endanger the whole by committing the management of affairs to his ſon's tutors.

Attalus, in the beginning of his reign, found himſelf greatly diſtreſſed by Pruſias king of Bithynia, who not only overthrew him in a pitched battle, but advanced to the very walls of Pergamus, ravaging the country as he marched along; and at laſt reduced the royal city itſelf. The king, however, ſaved himſelf by a timely flight, and diſpatched ambaſſadors to Rome, complaining of the bad uſage of Pruſias. The latter endeavoured to defend himſelf, and to throw the blame on Attalus.

Pergamus. lus. But, after a proper inquiry was made into the matter, Prusias was found to be entirely in the wrong; in consequence of which, he was at last obliged to conclude a peace with his adversary on the following terms. 1. That he should immediately deliver up to Attalus 20 ships with decks. 2. That he should pay 500 talents to Attalus within the space of 20 years. 3. That he should pay 100 talents to some of the other Asiatic nations by way of reparation for the damages they had sustained from him. And, 4. Both parties should be content with what they had before the beginning of the war.

Some time after this, Prusias having made an unnatural attempt on the life of his son Nicomedes, the latter rebelled, and, with the assistance of Attalus, drove his father from the throne, and, as is said, even murdered him in the temple of Jupiter. The Romans took no notice of these transactions, but showed the same kindness to Attalus as formerly. The last enterprise in which we find Attalus engaged, was against Andriscus the pretended son of Perses king of Macedon, where he assisted the Romans; after which he gave himself up entirely to ease and luxury, committing state affairs entirely to his ministers; and thus continued to his death, which happened in the 82d year of his age, about 138 B. C.

Attalus II. was succeeded by Attalus III. the son of Eumenes; for the late king, considering that he only held the crown as a trust for his nephew, passed by his own children in order to give it to him, though he appears to have been by no means worthy of it. He is said to have been deprived of his senses through the violence of his grief for his mother's death; and indeed, throughout his whole reign, he behaved more like a madman than any thing else. Many of his subjects of the highest quality were cut off with their wives and children, upon the most groundless suspicions; and for these executions he made use of mercenaries hired out from among the most barbarous nations. Thus he proceeded till he had cut off all the best men in the kingdom; after which he fell into a deep melancholy, imagining that the ghosts of those whom he had murdered were perpetually haunting him. On this he shut himself up in his palace, put on a mean apparel, let his hair and beard grow, and sequestered himself from all mankind. At last he withdrew from the palace, and retired into a garden, which he cultivated with his own hands, and filled with all sorts of poisonous herbs. These he used to mix with wholesome pulse, and send packets of them to such as he suspected. At last, being weary of this amusement, and living in solitude, because nobody durst approach him, he took it in his head to follow the trade of a founder, and make a brazen monument. But, while he laboured at melting and casting the brass, the heat of the sun and furnace threw him into a fever, which in seven days put an end to his tyranny, after he had sat on the throne five years.

On the death of the king, a will was found, by which he left the Roman people heirs of all his goods; upon which they seized on the kingdom, and reduced it to a province of their empire by the name of *Asia Proper*. But Aristonicus, a son of Eumenes by an Ephesian courtesan, reckoning himself the lawful heir to the crown, could by no means be satisfied with this usurpation of the Romans, and therefore assembled a considerable army to maintain his pretensions. The people in general, having been accustomed to a monarchy, dreaded a republican form of government; in consequence of which, they assisted Aristonicus, and soon put him in a condition to reduce the whole kingdom. The news, however, were soon carried to Rome; and Licinius Crassus, the pontifex maximus, was sent into the east, with orders to enforce obedience to the king's will. Historians take no notice of any forces which were sent along with this commander; whence it is supposed, that he depended on assistance from the Asiatics, who were in alliance with Rome, or from the Egyptians. But when he came thither, he found both the Syrians and Egyptians so reduced, that he could not expect any assistance from them. However, he was soon supplied with troops in plenty by the kings of Pontus, Bithynia, Cappadocia, and Paphlagonia; but managed matters so ill, that he was entirely defeated and taken prisoner. Those who took him, designed to carry him to Aristonicus; but he, not able to endure the disgrace, would have laid violent hands on himself if he had not been disarmed. However, being allowed to keep a rod for managing the horse on which he sat, he struck a Thracian soldier who stood near him so violently with it, that he beat out one of his eyes; upon which the other drew his sword, and run him through on the spot. His head was brought to Aristonicus, who exposed it to public view; but the body was honourably buried.

Aristonicus had no great time to enjoy the fruits of his victory. Indeed he behaved very improperly after it; for, instead of preparing to oppose the next army, which he might have been assured the Romans would send against him, he spent his time in feasting and revelling. But he was soon roused out of his lethargy by Perpenna the new consul, who having assembled with incredible expedition the troops of the allies, came unexpectedly upon him, obliged him to venture an engagement at a disadvantage, and entirely defeated him. Aristonicus fled to a city called *Stratonice*, but was so closely pursued by the conqueror, that the garrison, having no method of supplying themselves with provisions, delivered up their leader, as well as a philosopher named *Blosius*, who had been the companion and counsellor of Aristonicus. The philosopher behaved with great resolution after being taken, and openly defended his siding with Aristonicus, because he thought his cause just. He exhorted the latter to prevent the disgrace and misery of captivity by a voluntary death; but Aristonicus, looking upon death as a greater misery than any captivity, suffered himself to be treated as his conquerors pleased.

In the mean time, a new consul, named *Manius Aquilius*, being arrived from Rome, sent a most haughty message to Perpenna, requiring him immediately to deliver up Aristonicus, as a captive belonging to his triumph when the war should be ended. With this demand Perpenna refused to comply, and his refusal had almost produced a civil war. However, this was prevented by the death of Perpenna, which happened soon after the dispute commenced. The Pergamenians, notwithstanding the defeat and captivity of their leader, still held out with such obstinacy, that Aquilius was obliged to besiege, and take by force, almost every city in the kingdom. In doing this, he took a very effectual

tual, though exceeding cruel method. Moſt of the cities in the kingdom had no other water than what was brought from a conſiderable diſtance in aqueducts. Theſe Aquilius did not demoliſh, but poiſoned the water, which produced the greateſt abhorrence of him throughout all the eaſt. At laſt, however, the whole country being reduced, Aquilius triumphed, the unhappy Ariſtonicus was led in chains before his chariot, and probably ended his miſerable life in a dungeon. The country remained ſubject to the Romans while their empire laſted, but is now in the hands of the Turks. The city is half ruined, and is ſtill known by the name of *Pergamus*. It is inhabited by about 3000 Turks, and a few families of poor Chriſtians. E. Long. 27. 27. N. Lat. 30. 3.

PERGUNNAH, in the language of Hindoſtan, means the largeſt ſubdiviſion of a province, whereof the revenues are brought to one particular *head Cutchery*, from whence the accounts and caſh are tranſmitted to the general *Cutchery* of the province.

PERIAGOGE, in *Rhetoric*, is uſed where many things are accumulated into one period which might have been divided into ſeveral.

PERIAGUA, a kind of large canoe made uſe of in the Leeward iſlands, South America, and the gulf of Mexico. It is compoſed of the trunks of two trees hollowed and united together; and thus differs from the canoe, which is formed of one tree.

PERIANDER, tyrant of Corinth and Corcyra, was reckoned among the ſeven wiſe men of Greece; though he might rather have been reckoned among the moſt wicked men, ſince he changed the government of his country, deprived his countrymen of their liberty, uſurped the ſovereignty, and committed the moſt ſhocking crimes. In the beginning of his reign he behaved with mildneſs; but after his having ſent to the tyrant of Syracuſe to conſult him on the ſafeſt method of government, he abandoned himſelf to cruelty. The latter, having heard Periander's envoys, took them into a field, and, inſtead of anſwering them, pulled up before them the ears of corn which exceeded the reſt in height. Periander, on being told of this action, underſtood what was meant by it. He firſt ſecured himſelf by a good guard, and then put the moſt powerful Corinthians to death. He abandoned himſelf to the moſt enormous crimes; committed inceſt with his mother, kicked to death his wife Meliſſa, daughter of Procles king of Epidaurus, notwithſtanding her being with child; and was ſo enraged at Lycophron, his ſecond ſon, for lamenting his mother's death, that he baniſhed him into the iſland of Corcyra. Yet he paſſed for one of the greateſt politicians of his time; and Heraclides tells us, that he forbade voluptuouſneſs; that he impoſed no taxes, contenting himſelf with the cuſtom ariſing from the ſale and the import and export of commodities; that, though wicked himſelf, he hated the wicked, and cauſed all pimps to be drowned; laſtly, that he eſtabliſhed a ſenate, and ſettled the expence of its members. He died 585 B. C.

PERIANTHIUM, (from περι, "round," and ανθος, "the flower,") the flower cup properly ſo called, the moſt common ſpecies of calyx, placed immediately under the flower, which is contained in it as in a cup. See BOTANY *Index*.

PERICARDIUM, in *Anatomy*, a membranous bag filled with water, which contains the heart in man and many other animals. It is formed by a duplicature of the mediaſtinum, or membrane which divides the thorax into two unequal parts. See ANATOMY, N° 121.

PERICARPIUM, (from περι, "round," and καρπος, "fruit,") the ſeed-veſſel; that organ of a plant containing the ſeeds, which it diſcharges when ripe. The ſeed-veſſel is in fact the developed ſeed bud, and may very properly be compared to the fecundated ovary in animals; for it does not exiſt till after the fertilizing of the ſeeds by the male-duſt, and the conſequent fall of the flower. All plants, however, are not furniſhed with a ſeed-veſſel; in ſuch as are deprived of it, the receptacle or calyx performs its functions by incloſing the ſeeds, as in a matrix, and accompanying them to perfect maturity.

PERICHORUS, in antiquity, a name given by the Greeks to their profane games or combats, that is, to ſuch as were not conſecrated to any of the gods.

PERICLES, was one of the greateſt men that ever flouriſhed in Greece. He was educated with all imaginable care; and beſide other maſters, he had for his tutors Zeno, Eleates, and Anaxagoras. He learned from the laſt of theſe to fear the gods without ſuperſtition, and to account for an eclipſe from a natural cauſe. Many were unjuſt enough to ſuſpect him of atheiſm, becauſe he had perfectly ſtudied the doctrine of that philoſopher. He was a man of undoubted courage; and of ſuch extraordinary eloquence, ſupported and improved by knowledge, that he gained almoſt as great an authority under a republican government as if he had been a monarch; but yet he could not eſcape the ſatirical ſtrokes of the comic poets. His diſſoluteneſs with women was one of the vices with which he was chiefly charged. He died the third year of the Peloponneſian war, after long ſickneſs, which had weakened his underſtanding. Aſpaſia, Pericles's favourite, was a learned woman of Miletus: ſhe taught Socrates rhetoric and politics. As Pericles cared not much for his wife, he willingly gave her up to another, and married Aſpaſia, whom he paſſionately loved.

PERICRANIUM, in *Anatomy*, a thick ſolid coat or membrane covering the outſide of the cranium or ſkull. See ANATOMY, N° 4.

PERIGEE, in *Aſtronomy*, that point of the ſun or moon's orbit wherein they are at the leaſt diſtance from the earth; in which ſenſe it ſtands oppoſed to apogee.

PERIGORD, a province of France, which makes part of Guienne, bounded on the north by Angoumois and a part of Marche, and on the eaſt by Quercy and Limoſin; on the ſouth by Agenois and Bazadois; and on the weſt, by Bourledois, Angumois, and a part of Saintonge. It is about 83 miles in length, and 60 in breadth. It abounds in iron mines, and the air is pure and healthy. Perigueux is the capital town.

PERIGORD-Stone, is ſuppoſed to be an ore of mangameſe, of a dark gray colour, like baſalt.

PERIGRAPHE, a word uſually underſtood to expreſs a careleſs or inaccurate delineation of any thing; but in Veſalius it is uſed to expreſs the white lines or impreſſions that appear on the muſculus rectus of the abdomen.

PERIGUEUX, an ancient town of France, capital of the province of Perigord, feated on the river Ifle, in E. Long. 0. 33. N. Lat. 45. 18. It is remarkable for the ruins of the temple of Venus, and an amphitheatre.

PERIHELIUM, in *Aftronomy*, that part of a planet or comet's orbit wherein it is in its leaft diftance from the fun; in which fenfe it ftands in oppofition to aphelium.

PERIMETER, in *Geometry*, the bounds or limits of any figure or body. The perimeters of furfaces or figures are lines; thofe of bodies are furfaces. In circular figures, inftead of perimeter, we fay circumference, or periphery.

PERINÆUM, or PERINEUM, in *Anatomy*, the fpace between the anus and the parts of generation, divided into two equal lateral divifions by a very diftinct line, which is longer in males than in females.

PERIOD, in *Aftronomy*, the time taken up by a ftar or planet in making a revolution round the fun; or the duration of its courfe till it return to the fame part of its orbit. See PLANET.

The different periods and mean diftances of the feveral planets are as follows:

	Days.	h.	′	″	mean Dift.
Herfchel	30737	18			1908352
Saturn	10759	1	51	11	954072
Jupiter	4332	14	27	10	520279
Mars	686	23	30	35	152369
Earth	365	6	9	12	100000
Venus	224	16	49	10	72333
Mercury	87	23	15	43	38710

There is a wonderful harmony between the diftances of the planets from the fun, and their periods round him; the great law whereof is, that the fquares of the periodical times of the primary planet, are to each other as the cubes of their diftances from the fun: and likewife, the fquares of the periodical times of the fecondaries of any planet are to each other as the cubes of their diftances from that primary. This harmony among the planets is one of the greateft confirmations of the Copernican hypothefis. See ASTRONOMY, p. 100 and 101.

For the periods of the moon, fee MOON, ASTRONOMY *Index*.

The periods of feveral comets are now pretty well afcertained. See ASTRONOMY, N° 306.

PERIOD, in *Chronology*, denotes a revolution of a certain number of years, or a feries of years, whereby, in different nations, and on different occafions, time is meafured; fuch are the following.

Calippic PERIOD, a fyftem of feventy-fix years. See CALIPPIC, and ASTRONOMY, N° 11, &c.

Dionyfian PERIOD, or *Victorian Period*, a fyftem of 532 lunæ-folar and Julian years; which being elapfed, the characters of the moon fall again upon the fame day and feria, and revolve in the fame order, according to the opinion of the ancients.

This period is otherwife called the *great pafchal cycle*, becaufe the Chriftian church firft ufed it to find the true time of the pafcha or eafter. The fum of thefe years arifes by multiplying together the cycles of the fun and moon.

Hipparchus's PERIOD, is a feries of 304 folar years, returning in a conftant round, and reftoring the new and full moons to the fame day of the folar year, according to the fentiment of Hipparchus. This period arifes by multiplying the Calippic period by four.—Hipparchus affumed the quantity of the folar year to be 365 days 5 hours 55′ 12″; and hence concluded, that in 104 years Calippus's period would err a whole day. He therefore multiplied the period by four, and from the product caft away an entire day. But even this does not reftore the new and full moons to the fame day throughout the whole period; but they are fometimes anticipated 1 day 8 hours 23′ 29″ 20‴. See ASTRONOMY, N° 14.

Julian PERIOD. See JULIAN.

PERIOD, in *Grammar*, denotes a fmall compafs of difcourfe, containing a perfect fentence, and diftinguifhed at the end by a point, or full ftop, thus (.); and in members or divifions marked by commas, colons, &c.

Father Buffier obferves two difficulties in the ufe of the period, or point; i. e. in diftinguifhing it from the colon, or double point; and in determining juftly the end of a period, or perfect fentence. It is remarked that the fupernumerary members of a period, feparated from the reft by colons and femicolons, ufually commence with a conjunction: yet it is true thefe fame conjunctions fometimes rather begin new periods than fupernumerary members of old ones. It is the fenfe of things, and the author's own difcretion, that muft make the proper diftinction which of the two in effect it is. No rules will be of any fervice, unlefs this be admitted as one, that when what follows the conjunction is of as much extent as what precedes it, it is ufually a new period; otherwife not.

The fecond difficulty arifes hence, that the fenfe appears perfect in feveral fhort detached phrafes, wherein it does not feem there fhould be periods; a thing frequent in free difcourfe: as, *We are all in fufpenfe: make your propofals immediately: you will be to blame for detaining us longer*. Where it is evident, that fimple phrafes have perfect fenfes like periods, and ought to be marked accordingly; but that the fhortnefs of the difcourfe making them eafily comprehended, the pointing is neglected.

De Colonia defines period a fhort but perfect fentence, confifting of certain parts or members, depending one on another, and connected together by fome common vinculum. The celebrated definition of Ariftotle is, a period is a difcourfe which has a beginning, a middle, and an end, all vifible at one view. Rhetoricians confider period, which treats of the ftructure of fentences, as one of the four parts of compofition. The periods allowed in oratory are three: A period of two members, called by the Greeks *dicolos*, and by the Latins *bimembris*; a period of three members, *tricolos*, *trimembris*; and a period of four, *quadrimembris*, *tetracolos*. See PUNCTUATION.

PERIOD, in numbers, is a diftinction made by a point or comma, after every fixth place, or figure; and is ufed in numeration, for the readier diftinguifhing and naming the feveral figures or places; which fee under NUMERATION.

PERIOD, in *Medicine*, is applied to certain difeafes which have intervals and returns, to denote an entire courfe

Period || Peripatetics.

course or circle of such disease; or its progress from any state through all the rest till it return to the same again.

Galen describes period as a time composed of an intension and remission; whence it is usually divided into two parts, the paroxysm or exacerbation, and remission.

In intermitting fevers, the periods are usually stated and regular; in other diseases, as the epilepsy, gout, &c. they are vague or irregular.

PERIOD, in *Oratory*. See there, N° 47.

PERIODIC, or PERIODICAL, something that terminates and comprehends a period; such is a periodic month; being the space of time wherein the moon dispatches her period.

PERIOECI, περίοικοι, in *Geography*, such inhabitants of the earth as have the same latitudes, but opposite longitudes, or live under the same parallel and the same meridian, but in different semicircles of that meridian, or in opposite points of the parallel. These have the same common seasons throughout the year, and the same phenomena of the heavenly bodies; but when it is noonday with the one, it is midnight with the other, there being twenty-four hours in an east or west direction. These are found on the globe by the hour-index, or by turning the globe half round, that is, 180 degrees either way.

PERIOSTEUM, or PERIOSTIUM, in *Anatomy*, a nervous vascular membrane, endued with a very quick sense, immediately surrounding, in every part, both the internal and external surfaces of all the bones in the body, excepting only so much of the teeth as stand above the gums, and the peculiar places on the bones in which the muscles are inserted. It is hence divided into the external and internal periosteum; and where it externally surrounds the bones of the skull, it is generally called the *pericranium*. See ANATOMY *Index*.

PERIPATETICS, philosophers, followers of Aristotle, and maintainers of the peripatetic philosophy; called also *Aristotelians*. Cicero says, that Plato left two excellent disciples, Xenocrates and Aristotle, who founded two sects, which only differed in name: the former took the appellation of *Academics*, who were those that continued to hold their conferences in the Academy, as Plato had done before; the others, who followed Aristotle, were called *Peripatetics*, from περιπατεω, "I walk;" because they disputed walking in the Lyceum.

Ammonius derives the name Peripatetic from Plato himself, who only taught walking; and adds, that the disciples of Aristotle, and those of Xenocrates, were equally called Peripatetics; the one Peripatetics of the Academy, the other Peripatetics of the Lyceum: but that in time the former quitted the title Peripatetic for that of Academic, on account of the place where they assembled; and the latter retained simply that of Peripatetic. The greatest and best part of Aristotle's philosophy was borrowed from Plato. Serranus asserts, and says he could demonstrate, that there is nothing exquisite in any part of Aristotle's philosophy, dialectics, ethics, politics, physics, or metaphysics, but is found in Plato. And of this opinion are many of the ancient authors, such as Clemens Alexandrinus, &c. Gale attempts to show, that Aristotle borrowed a good deal of his philosophy, both physical, about the first matter, and metaphysical about the first being, his affections, truth, unity, goodness, &c. from the Scriptures; and adds from Clearchus, one of Aristotle's scholars, that he made use of a certain Jew, who assisted him therein.

Peripatetics.

Aristotle's philosophy preserved itself *in puris naturalibus* for a long time: in the earlier ages of Christianity, the Platonic philosophy was generally preferred; but this did not prevent the doctrine of Aristotle from forcing its way into the Christian church. Towards the end of the fifth century, it rose into great credit; the Platonics interpreting in their schools some of the writings of Aristotle, particularly his dialectics, and recommending them to young persons. This appears to have been the first step to that universal dominion which Aristotle afterwards obtained among the learned, which was at the same time much promoted by the controversies which Origen had occasioned. This father was zealously attached to the Platonic system; and therefore, after his condemnation, many, to avoid the imputation of his errors, and to prevent their being counted among the number of his followers, openly adopted the philosophy of Aristotle. Nor was any philosophy more proper for furnishing those weapons of subtle distinctions and captious sophisms, which were used in the Nestorian, Arian, and Eutychian controversies. About the end of the sixth century, the Aristotelian philosophy, as well as science in general, was almost universally decried; and it was chiefly owing to Boethius, who explained and recommended it, that it obtained a higher degree of credit among the Latins than it had hitherto enjoyed. Towards the end of the seventh century, the Greeks abandoned Plato to the monks, and gave themselves up entirely to the direction of Aristotle; and in the next century, the Peripatetic philosophy was taught everywhere in their public schools, and propagated in all places with considerable success. John Damascenus very much contributed to its credit and influence, by composing a concise, plain, and comprehensive view of the doctrines of the Stagirite, for the instruction of the more ignorant, and in a manner adapted to common capacities. Under the patronage of Photius, and the protection of Bardas, the study of philosophy for some time declined, but was revived again about the end of the ninth century. About the middle of the 11th century, a revolution in philosophy commenced in France; when several famous logicians, who followed Aristotle as their guide, took nevertheless the liberty of illustrating and modelling anew his philosophy, and extending it far beyond its ancient limits. In the 12th century, three methods of teaching philosophy were in use by the different doctors: the first was the ancient and plain method, which confined its researches to the philosophical notions of Porphyry, and the dialectic system, commonly attributed to St Augustine, and in which was laid down this general rule, that philosophical inquiries were to be limited to a small number of subjects, lest by their becoming too extensive, religion might suffer by a profane mixture of human subtilty with its divine wisdom. The second method was called the Aristotelian, because it consisted in explications of the works of that philosopher, several of whose books, being translated into Latin, were almost everywhere in the hands of the learned. The third was termed the free method, employed by such as were bold enough to search

after

after truth, in the manner the moſt adapted to render their inquiries ſucceſsful, without rejecting the ſuccours of Ariſtotle and Plato. A reformed ſyſtem of the Peripatetic philoſophy was firſt introduced into the ſchools in the univerſity of Paris, from whence it ſoon ſpread throughout Europe; and has ſubſiſted in ſome univerſities even to this day, under the name of *ſchool philoſophy*. The foundation thereof is Ariſtotle's doctrine, often miſunderſtood, but oftener miſapplied: whence the retainers thereto may be denominated *Reformed Peripatetics*. Out of theſe have ſprung, at various times, ſeveral branches; the chief are, the THOMISTS, SCOTISTS, and NOMINALISTS. See theſe articles.

The Peripatetic ſyſtem, after having prevailed with great and extenſive dominion for many centuries, began rapidly to decline towards the cloſe of the 17th, when the diſciples of Ramus attacked it on the one hand, and it had ſtill more formidable adverſaries to encounter in Deſcartes, Gaſſendi, and Newton. See PHILOSOPHY.

PERIPATON, in antiquity, the name of that walk in the Lyceum where Ariſtotle taught, and whence the name of Peripatetics given to his followers.

PERIPETIA, in the drama, that part of a tragedy wherein the action is turned, the plot unravelled, and the whole concludes. See CATASTROPHE.

PERIPHERY, in *Geometry*, the circumference of a circle, ellipſis, or any other regular curvilinear figure. See GEOMETRY.

PERIPHRASIS, circumlocution, formed of περι, "about," and φραζω, "I ſpeak;" in rhetoric, a circuit or tour of words, much affected by orators, to avoid common and trite manners of expreſſion. The periphraſis is of great uſe on ſome occaſions; and it is often neceſſary to make things be conceived which are not proper to name. It is ſometimes polite to ſuppreſs the names, and only intimate or deſign them. Theſe turns of expreſſion are alſo particularly ſerviceable in oratory; for the ſublime admitting of no direct citations, there muſt be a compaſs taken to inſinuate the authors whoſe authority is borrowed. A periphraſis, by turning round a proper name to make it underſtood, amplifies and raiſes the diſcourſe; but care muſt be taken it be not too much ſwelled, nor extended, *mal à propos*; in which caſe it becomes flat and languid. See CIRCUMLOCUTION and ORATORY.

PERIPLOCA, VIRGINIAN SILK: a genus of plants belonging to the pentandria claſs; and in the natural method ranking under the 30th order, *Contortæ*. See BOTANY *Index*.

PERIPNEUMONY, Περιπνευμονια, formed from περι, "about," and πνευμων, "lungs," in *Medicine*, an inflammation of ſome part of the thorax, properly of the lungs; attended with an acute fever, and a difficulty of breathing. See MEDICINE, N° 184.

PERIRRHANTERIUM, a veſſel of ſtone or braſs which was filled with holy water, and with which all thoſe were ſprinkled who were admitted by the ancients to their ſacrifices. Beyond this veſſel no profane perſon was allowed to paſs. We are told by ſome, that it was placed in the *adytum*, or inmoſt receſs of the temple; others ſay it was placed at the door, which indeed ſeems to be the moſt likely opinion. It was uſed both by Greeks and Romans, and has been evidently borrowed, like many other Pagan ceremonies, by the church of Rome. The Hebrews alſo had a veſſel for purification.

PERISCII, in *Geography*, the inhabitants of either frigid zone, between the polar circles and the poles, where the ſun, when in the ſummer ſigns, moves only round about them, without ſetting; and conſequently their ſhadows in the ſame day turn to all the points of the horizon.

PERISTALTIC, a vermicular ſpontaneous motion of the inteſtines, performed by the contraction of the circular and longitudinal fibres of which the fleſhy coats of the inteſtines are compoſed; by means whereof the chyle is driven into the orifices of the lacteal veins, and the fæces are protruded towards the anus.

PERISTYLE, in *Ancient Architecture*, a building encompaſſed with a row of columns on the inſide.

PERITONÆUM, in *Anatomy*, is a thin, ſmooth, and lubricous membrane, inveſting the whole internal ſurface of the abdomen, and containing moſt of the viſcera of that part as it were in a bag. See ANATOMY *Index*.

PERITROCHIUM, in *Mechanics*, denotes a wheel, or circle, concentric with the baſe of a cylinder, and moveable together with it about its axis. See MECHANICS.

PERJURY, in *Law*, is defined by Sir Edward Coke to be a crime committed when a lawful oath is adminiſtered, in ſome judicial proceeding, to a perſon who ſwears wilfully, abſolutely, and falſely, in a matter material to the iſſue or point in queſtion. In ancient times it was in ſome places puniſhed with death; in others it made the falſe ſwearer liable to the puniſhment due to the crime he had charged the innocent perſon with; in others a pecuniary mulct was impoſed. But though it eſcaped human, yet it was thought, amongſt the ancients in general, that the divine vengeance would moſt certainly overtake it; and there are many ſevere inflictions from the hand of God upon record, as monuments of the abhorrence in which this atrocious crime is held by the Deity. The ſouls of the deceaſed were ſuppoſed to be employed in puniſhing perjured perſons. Even the inanimate creation was thought to take revenge for this crime. The Greeks ſuppoſed that no perſon could ſwear falſely by Styx without ſome remarkable puniſhment; and that no perſon guilty of perjury could enter the cave of Palæmon at Corinth without being made a memorable example of divine juſtice. In Sicily, at the temple of the Palici, there were fountains called *Delli*, from which iſſued boiling water, with flames and balls of fire; and we are told that if any perſon ſwore falſely near them, he was inſtantly ſtruck dumb, blind, lame, or dead, or was ſwallowed up by the waters. But although perjury was thus held in general abhorrence, notwithſtanding the credit which was given to ſuch accounts of divine inflictions, it was ſo much practiſed by the Greeks, that *Græca fides* became a proverb. Lovers perjuries, however, were ſuppoſed to paſs unnoticed, or to be very ſlightly puniſhed with blackneſs of the nails, a decayed tooth, or ſome ſmall diminution of beauty.

The ancient philoſophers, however, were ſo afraid of perjury, that even an oath before a judge was never admitted but for want of other proof. Plato's precept was, "Not to adminiſter an oath wantonly, but on deep grounds, and with the ſtricteſt caution." Ulpian gives

Perjury.

his opinion thus: "Some are forward to take oaths from a contempt of religion; others, from an extraordinary awe of the Divine Majesty, carry their fear to an unreasonable superstition; so make an equitable decision of a judge necessary." "No man will perjure himself (says Aristotle) who apprehends vengeance from Heaven and disgrace among men." Clinias was so very scrupulous, that rather than take an oath (though lawfully), he suffered the loss of three talents. Perjury, in the time of Philo Judeus, was abominated and capitally punished among the Jews; though since they have much degenerated, having been poisoned with the books of the Talmud, which says, "He who breaks his promissory oath, or any vows he enters into by the year, if he has a mind that they should be ineffectual and invalid, let him rise the last day of the year, and say, Whatever promises, oaths, and vows I may think fit to make in the year following, let them be null, void, and of no effect." Tract. iii. part 3. of the *Talmud*, in the treatise *Nedharim*, ch. 4. And the modern Jews use the same artifice, thinking they may then lawfully deceive the Christians. See *Hieron. ex Dictis Talmud*, c. 3. and *Magister Joannes de Concor. Legum*, tit. iv. c. 7.

In our law, no notice is taken of any perjury but such as is committed in some court of justice having power to administer an oath; or before some magistrate or proper officer invested with a similar authority, in some proceedings relative to a civil suit or a criminal prosecution: for it esteems all other oaths unnecessary at least, and therefore will not punish the breach of them. For which reason it is much to be questioned, how far any magistrate is justifiable in taking a voluntary affidavit in any extrajudicial matter, as is now too frequent upon every petty occasion; since it is more than possible that, by such idle oaths, a man may frequently, *in foro conscientiæ*, incur the guilt, and at the same time evade the temporal penalties of perjury. The perjury must also be corrupt (that is, committed *malo animo*), wilful, positive, and absolute; not upon surprise, or the like: it also must be in some point material to the question in dispute; for if it only be in some trifling collateral circumstance, to which no regard is paid, it is no more penal than in the voluntary extrajudicial oaths before mentioned. Subornation of perjury is the offence of procuring another to take such a false oath as constitutes perjury in the principal. The punishment of perjury and subornation, at common law, has been various. It was anciently death; afterwards banishment, or cutting out the tongue; then forfeiture of goods; and now it is fine and imprisonment, and never more to be capable of bearing testimony. But the statute 5 Eliz. c. 9. (if the offender be prosecuted thereon) inflicts the penalty of perpetual infamy, and a fine of 40l. on the suborner; and in default of payment, imprisonment for six months, and to stand with both ears nailed to the pillory. Perjury itself is thereby punished with six months imprisonment, perpetual infamy, and a fine of 20l. or to have both ears nailed to the pillory. But the prosecution is usually carried on for the offence at common law; especially as, to the penalties before inflicted, the statute 2 Geo. II. c. 25. superadds a power for the court to order the offender to be sent to the house of correction for a term not exceeding seven years or to be transported for the same period; and makes it felony, without benefit of clergy, to return or escape within the time. It has sometimes been wished, that perjury, at least upon capital accusations, whereby another's life has been or might have been destroyed, was also rendered capital, upon a principle of retaliation; as it was universally by the laws of France. And certainly the odiousness of the crime pleads strongly in behalf of the French law. But it is to be considered, that they admitted witnesses to be heard only on the side of the prosecution, and used the rack to extort a confession from the accused. In such a constitution, therefore, it was necessary to throw the dread of capital punishment into the other scale, in order to keep in awe the witnesses for the crown; on whom alone the prisoner's fate depended: so naturally does one cruel law beget another. But corporal and pecuniary punishments, exile, and perpetual infamy, are more suited to the genius of the English law; where the fact is openly discussed between witnesses on both sides, and the evidence for the crown may be contradicted and disproved by those of the prisoner. Where indeed the death of an innocent person has actually been the consequence of such wilful perjury, it falls within the guilt of deliberate murder, and deserves an equal punishment; which our ancient law in fact inflicted. But the mere attempt to destroy life by other means not being capital, there is no reason that an attempt by perjury should; much less that this crime should, in all judicial cases, be punished with death. For to multiply capital punishments lessens their effect, when applied to crimes of the deepest dye; and, detestable as perjury is, it is not by any means to be compared with some other offences, for which only death can be inflicted; and therefore it seems already (except perhaps in the instance of deliberate murder by perjury) very properly punished by our present law; which has adopted the opinion of Cicero, derived from the law of the twelve tables, *Perjurii pœna divina, exitium; humana, dedecus.* See OATH.

Perjury || Perizzites.

PERIWIG. See PERRUKE.

PERIZONIUS, JAMES, a learned and laborious writer, was born at Dam in 1651. He became professor of history and eloquence at the university of Francker, when, by his merit and learning, he made that university flourish. However, in 1693, he went to Leyden, where he was made professor of history, eloquence, and the Greek tongue; in which employment he continued till his death, which happened in 1715. He wrote many Dissertations, and other learned and curious works, particularly *Origines Babylonicæ et Egyptiacæ*, 2 vols. 8vo, &c. But the part of his labours which is the most generally known, and perhaps the most useful, is the notes which he wrote upon *Sanctii Minerva*. That work, as published by Perizonius, certainly suggested the idea of Harris's Hermes; and we hesitate not to say, that our countryman has made hardly any improvement on the system of his master.

PERIZZITES, the ancient inhabitants of Palestine, mingled with the Canaanites. There is also great probability that they themselves were Canaanites; but having no fixed habitations, sometimes dispersed in one country and sometimes in another, they were for that reason called *Perizzites*, which signifies *scattered* or *dispersed*. *Pherazoth* stands for *hamlets* or *villages*. The Perizzites did not inhabit any certain portion of the land of Canaan; there were some of them on both sides

the

the river Jordan, in the mountains, and in the plains. In feveral places of Scripture the Canaanites and Perizzites are mentioned as the two chief people of the country. It is faid, for example, that in the time of Abraham and Lot the Canaanite and Perizzite were in the land (Gen. xiii. 7.). The Ifraelites of the tribe of Ephraim complained to Jofhua that they were too much pent up in their poffeffion (Jofh. xvii. 15.): he bid them go, if they pleafed, into the mountains of the Perizzites, and Rephaims or giants, and there clearing the land, to cultivate and inhabit it. Solomon fubdued the remains of the Canaanites and Perizzites which the children of Ifrael had not rooted out, and made them tributary to him (1 Kings ix. 20, 21. and 2 Chr. viii. 7.). There is ftill mention made of the Perizzites in the time of Ezra (ix. 1.), after the return from the captivity of Babylon; and feveral Ifraelites had married wives from that nation.

PERKIN, a beverage prepared from pears. See CYDERKIN, under AGRICULTURE, N° 656.

PERMEABLE, a term applied to bodies of fo loofe a texture as to let fomething pafs through them.

PERMSKI, or PERMIA, a town of the Ruffian empire, and capital of a province of the fame name, feated on the river Kama between the Dwina and the Oby; E. Long. 55. 50. N. Lat. 70. 26. The province is bounded on the north by the Samoiedes, on the weft by Zirania and Ulatka, and on the eaft by Siberia.

PERMUTATION, in commerce, the fame with bartering. In the canon-law, permutation denotes the actual exchange of one benefice for another.

PERNAMBUCO, a province of Brazil, in South America, bounded on the north by Tamera, on the eaft by the ocean, on the fouth by Seregippa, and on the weft by Tapuyers. It is about 200 miles in length and 150 in breadth. The Dutch became mafters of it in 1630, but the Portuguefe foon after retook it. It produces a great quantity of fugar, cotton, and the beft Brazil wood.

PERNIO, a kibe or chilblain, is a little ulcer, occafioned by cold in the hands, feet, heels, nofe, and lips. It will come on when warm parts are too fuddenly expofed to cold, or when parts from being too cold are fuddenly expofed to a confiderable warmth; and has always a tendency to gangrene, in which it frequently terminates. It moft commonly attacks children of a fanguine habit and delicate conftitution; and may be prevented or removed by fuch remedies as invigorate the fyftem, and are capable of removing any tendency to gangrene in the conftitution.

PERONÆUS, in *Anatomy*, is an epithet applied to fome of the mufcles of the perone or fibula. See ANATOMY, *Table of the Mufcles*.

PERONES, a fort of high fhoes which were worn not only by country people, but by men of ordinary rank at Rome. In the early times of the commonwealth they were worn even by fenators; but at laft they were difufed by perfons of figure, and confined to ploughmen and labourers. They were very rudely formed, confifting only of hides undreffed, and reaching to the middle of the leg. Virgil mentions the perones as worn by a company of ruftic foldiers on one foot only.

PERONNE, a ftrong town of France, in Picardy, capital of Santerre. It is faid never to have been taken, though often befieged. It is feated on the river Somme, in E. Long. 3. 1. N. Lat. 44. 50.

PERORATION, in *Rhetoric*, the epilogue or laft part of an oration, wherein what the orator had infifted on through his whole difcourfe is urged afrefh with greater vehemence and paffion. The peroration confifts of two parts. 1. Recapitulation; wherein the fubftance of what was diffufed throughout the whole fpeech is collected briefly and curforily, and fummed up with new force and weight. 2. The moving the paffions; which is fo peculiar to the peroration, that the mafters of the art call this part *fedes affectuum*. The paffions to be raifed are various, according to the various kinds of oration. In a panegyric, love, admiration, emulation, joy, &c. In an invective, hatred, contempt, &c. In a deliberation, hope, confidence, or fear. The qualities required in the peroration are, that it be very vehement and paffionate, and that it be fhort; becaufe, as Cicero obferves, tears foon dry up. Thefe qualities were well obferved by Cicero, who never had an equal in the management of this part of an orator's province; for peroration was his mafter-piece.

"Concerning peroration (fays Dr Blair), it is needlefs to fay much, becaufe it muft vary fo confiderably, according to the ftrain of the preceding difcourfe. Sometimes the whole pathetic part comes in moft properly at the peroration. Sometimes, when the difcourfe has been entirely argumentative, it is fit to conclude with fumming up the arguments, placing them in one view, and leaving the impreffion of them full and ftrong on the mind of the audience. For the great rule of a conclufion, and what nature obvioufly fuggefts, is, to place that laft on which we choofe that the ftrength of our cafe fhould reft.

"In all difcourfes, it is a matter of importance to hit the precife time of concluding, fo as to bring our difcourfe juft to a point; neither ending abruptly and unexpectedly, nor difappointing the expectation of the hearers when they look for the clofe, and continuing to hover round and round the conclufion till they become heartily tired of us. We fhould endeavour to get off with a good grace; not to end with a languifhing and drawling fentence, but to clofe with dignity and fpirit, that we may leave the minds of the hearers warm, and difmifs them with a favourable impreffion of the fubject and of the fpeaker."

PEROTIS, a genus of plants belonging to the triandria clafs, and in the natural method ranking under the 4th order, *Gramina*. See BOTANY *Index*.

PERPENDICULAR, in *Geometry*, a line falling directly on another line, fo as to make equal angles on each fide. See GEOMETRY.

PERPETUAL, fomething that endures always, or lafts for ever.

PERPETUAL Motion. See MOVEMENT.

PERPIGNAN, a confiderable town of Roufillon, in France, with a ftrong citadel, an univerfity, and a bifhop's fee. It is feated on the river Tet; over which there is a handfome bridge. E. Long. 0. 43. N. Lat. 45. 18.

PERQUISITE, in a general fenfe, fomething gained by a place over and above fettled wages.

PERQUISITE,

PERQUISITE, in *Law*, is any thing gotten by a man's own induſtry, or purchaſed with his money; in contradiſtinction to what deſcends to him from his father or other anceſtor.

PERRAULT, Claude, the ſon of an advocate in parliament, was born at Paris in 1613; and was bred a phyſician, though he never practiſed but among his relations, friends, and the poor. He diſcovered early a particular taſte for the ſciences and fine arts; of which he acquired a conſummate knowledge without the aſſiſtance of a maſter: he excelled in architecture, painting, ſculpture, mathematics, phyſics, and all thoſe arts that relate to deſigning and mechanics. The entrance into the Louvre, which was deſigned by him, is, according to the judgment of Voltaire, one of the moſt auguſt monuments of architecture in the world. M. Colbert put him upon tranſlating Vitruvius into French; which he performed, and publiſhed it in 1673, folio, with figures from his own drawings; which are ſaid to have been more exactly finiſhed than the plates themſelves. When the academy of ſciences was eſtabliſhed, he was one of its firſt members, and was chiefly depended on for mechanics and natural philoſophy. His works are, *Memoires pour ſervir à l'Hiſtoire naturelle des Animaux*, folio, 1676, with figures; *Eſſais de Phyſique*, 4 vols. 12mo, 1688; *Recueil des pluſieurs machines de nouvelle invention*, 4to, 1700, &c. He died in 1688.

Perrault, *Charles*, the brother of Claude, was born at Paris in 1626, with as great a genius for arts, and a greater for letters, than his brother. Colbert choſe him firſt clerk of the buildings, of which he was ſuperintendant, and afterward made him comptroller-general of the finances under him. He was one of the firſt members of the academy of the belles lettres and inſcriptions, and was received into the French academy in 1671. His poem, *La Peinture*, printed in 1668, was univerſally admired: that entitled *Le ſiecle de Louis le Grand*, in which he exalted the modern authors above the ancient, was a prelude to a war with all the learned. After he had diſengaged himſelf from this conteſt, he applied himſelf to draw up elogies of ſeveral great men of the 17th century, with their portraits, of which he has collected 102. There are other eſteemed works of Perrault.—Beſides theſe there were two other brothers, *Peter* and *Nicholas*, who made themſelves known in the literary world.

PERRON, James Davy du, a cardinal, diſtinguiſhed by his abilities and learning, was born in the canton of Bern in 1556. He was educated by Julian Davy, his father, a learned Calviniſt, who taught him Latin and the mathematics; after which, he by himſelf became acquainted with the Greek and Hebrew, philoſophy, and the poets. Philip Deſportes, abbot of Tyron, made him known to Henry III. king of France, who conceived a great eſteem for him. Some time after, Du Perron abjured Calviniſm, and afterwards embraced the eccleſiaſtical function; and having given great proofs of his wit and learning, he was choſen to pronounce the funeral oration of Mary queen of Scots. After the murder of Henry III. he retired to the houſe of Cardinal de Bourbon, and took great pains in bringing back the Proteſtants to the church of Rome. Among others he gained over Henry Spondanus, afterwards biſhop of Pamiers. He alſo chiefly contributed to engage Henry IV. to change his religion; and that prince ſent him to negotiate his reconciliation to the holy ſee, in which he ſucceeded. Du Perron was conſecrated biſhop of Evreaux while he reſided at Rome. On his return to France, he wrote, preached, and diſputed againſt the reformed; particularly againſt Du Pleſſis Mornay, with whom he had a public conference in the preſence of the king at Fontainbleau. He was made cardinal in 1604 by Pope Clement VIII. at the ſolicitation of Henry IV. who afterwards nominated him to the archbiſhopric of Sens. The king at length ſent him to Rome with Cardinal Joyeuſe, in order to terminate the diſputes which had ariſen between Paul V. and the Venetians. It is ſaid that this pope had ſuch a high opinion of the addreſs of the cardinal Du Perron, that he uſed to ſay, "Let us pray to God to inſpire the cardinal Du Perron, for he will perſuade us to do whatever he pleaſes." After the death of Henry IV. he retired into the country, where he put the laſt hand to his work; and, ſetting up a printing-houſe, corrected every ſheet himſelf. He died at Paris in 1618. His works were collected after his death, and publiſhed at Paris in 3 vols. folio.

PERROT, Nicholas, Sieur d'Ablancourt, one of the firſt geniuſes of his age, was born at Chalons in 1606. After ſtudying philoſophy about three years, he was ſent to Paris to follow the law. At eighteen years of age he was admitted advocate of parliament, and frequented the bar; but he ſoon conceived a diſtaſte for it, and therefore diſcontinued his practice. This diſpleaſed an uncle, but whoſe favour he recovered by quitting the Proteſtant religion. He could not, however, be prevailed upon to take orders in the Romiſh church; and ſome years after, he had a deſire to return to the religion he had abjured. But, that he might not do any thing raſhly, he reſolved to ſtudy philoſophy and divinity. For that purpoſe he choſe for his maſter Mr Stuart a Scotſman and Lutheran, a man of great learning. Almoſt three years he ſpent in the moſt aſſiduous ſtudy; and then ſet out from Paris to Champagne, where he abjured the Roman Catholic, and once more embraced the Proteſtant religion. In 1637 he was admitted a member of the French academy; a little after which he undertook a tranſlation of Tacitus. Whilſt he was engaged in that laborious taſk, he retired to his ſmall eſtate of Ablancourt, and lived there till his death in 1664. He was a man of fine underſtanding, of great piety and integrity, and of univerſal learning. Moreri has given a catalogue of his works, the greateſt part of which conſiſt of tranſlations, which ſeemed rather originals.

PERRUKE, Peruke, or *Periwig*, was anciently a name for a long head of natural hair; ſuch, particularly, as there was care taken in the adjuſting and trimming of. Menage derives the word rather fancifully from the Latin *pilus*, "hair." It is derived, according to this critic, thus, *pilus, pelus, pelutus, peluticus, pelutica, perutica, peruca, perruque*. The Latins called it *coma*; whence part of Gaul took the denomination of *Gallia Comata*, from the long hair which the inhabitants wore as a ſign of freedom. An ancient author ſays, that Abſalom's perruke weighed 200 ſhekels.

The word is now uſed for a ſet of falſe hair, curled, buckled, and ſewed together on a frame or cawl; anciently

Perruke, Perry.

ciently called *capillamentum* or "false perruke." It is doubted whether or not the use of perrukes of this kind was known among the ancients. It is true, they used false hair: Martial and Juvenal make merry with the women of their time, for making themselves look young with their borrowed hair; with the men who changed their colours according to the seasons; and with the dotards, who hoped to deceive the Destinies by their white hair. But these seem to have scarce had any thing in common with our perrukes; and were at best only composed of hair painted, and glued together. Nothing can be more ridiculous than the description Lampridius gives of the emperor Commodus's perruke: it was powdered with scrapings of gold, and oiled (if we may use the expression) with glutinous perfumes for the powder to hang by. In effect, the use of perrukes, at least in their present mode, is not much more than 160 years old; the year 1629 is reckoned the epocha of long perrukes, at which time they began to appear in Paris; from whence they spread by degrees through the rest of Europe. At first it was reputed a scandal for young people to wear them, because the loss of their hair at that age was attributed to a disease the very name whereof is a reproach; but at length the mode prevailed over the scruple, and persons of all ages and conditions have worn them, foregoing without any necessity the conveniences of their natural hair. It was, however, some time before the ecclesiastics came into the fashion: the first who assumed the perruke were some of the French clergy, in the year 1660; nor is the practice yet well authorized. Cardinal Grimaldi in 1684, and the bishop of Lavaur in 1688, prohibited the use of the perruke to all priests without a dispensation or necessity. M. Thiers has an express treatise, to prove the perruke indecent in an ecclesiastic, and directly contrary to the decrees and canons of councils. A priest's head, embellished with artificial hair curiously adjusted, he esteems a monster in the church; nor can he conceive any thing so scandalous as an abbot with a florid countenance, heightened with a well-curled perruke.

PERRY, Captain John, was a famous engineer, who resided long in Russia, having been recommended to the czar Peter while in England, as a person capable of serving him on a variety of occasions relating to his new design of establishing a fleet, making his rivers navigable, &c. His salary in this service was 300l. per annum, besides travelling expences and subsistence money on whatever service he should be employed, together with a further reward to his satisfaction at the conclusion of any work he should finish. After some conversation with the czar himself, particularly respecting a communication between the rivers Volga and Don, he was employed on that work for three summers successively; but not being well supplied with men, partly on account of the ill success of the czar's arms against the Swedes at the battle of Narva, and partly by the discouragement of the governor of Astracan, he was ordered at the end of 1707 to stop, and next year was employed in refitting the ships at Veronise, and 1700 in making the river of that name navigable; but after repeated disappointments, and a variety of fruitless applications for his salary, he at last quitted the kingdom, under the protection of Mr Whitworth, the English ambassador, in 1712: (See his narrative in the Preface to *The State of Russia*). In 1721 he was employed in stopping with success the breach at Dagenham, in which several other undertakers had failed; and the same year about the harbour at Dublin, to the objections against which he then published an Answer. He was author of The State of Russia, 1716, 8vo, and an account of the stopping of Dagenham Breach, 1721, 8vo; and died February 11, 1733.

Perry, Persecution.

Perry, the name of a very pleasant and wholesome liquor extracted from pears, in the same manner as cyder is from apples. See Cyder, and Agriculture *Index*.

The best pears for perry, or at least the sorts which have been hitherto deemed the fittest for making this liquor, are of a tart and harsh quality. Of these the Bosbury pear, the Bareland pear, and the horse pear, are the most esteemed for perry in Worcestershire, and the squash pear, as it is called, in Gloucestershire; in both which counties, as well as in some of the adjacent parts, they are planted in the hedge-rows and most common fields. There is this advantage attending pear-trees, that they will thrive on land where apples will not so much as live, and that some of them grow to such a size, that a single pear-tree, particularly of the Bosbury and the squash kind, has frequently been known to yield, in one season, from one to four hogsheads of perry. The Bosbury pear is thought to yield the most lasting and most vinous liquor. The John pear, the Harpary pear, the Drake pear, the Mary pear, the Lullum pear, and several others of the harshest kinds, are esteemed the best for perry, but the redder or more tawney they are, the more they are preferred. Pears, as well as apples, should be full ripe before they are ground.

Dr Beale, in his general advertisements concerning cyder, subjoined to Mr Evelyn's Pomona, disapproves of Palladius's saying, that perry will keep during the winter, but that it turns sour as soon as the weather begins to be warm; and gives, as his reasons for being of a contrary opinion, that he had himself tasted at the end of summer, a very brisk, lively, and vinous liquor, made of horse pears; that he had often tried the juice of the Bosbury pear, and found it both pleasanter and richer the second year, and still more so the third, though kept only in common hogsheads, and in but indifferent cellars, without being bottled; and that a very honest, worthy, and ingenious gentleman in his neighbourhood, assured him, as of his own experience, that it will keep a great while, and grow much the stronger for keeping, if put into a good cellar and managed with due care. He imputes Palladius's error to his possibly speaking of common eatable pears, and to the perry's having been made in a very hot country: but he would have ascribed it to a more real cause, perhaps, had he pointed out the want of a thorough regular fermentation, to which it appears plainly that the ancients were entire strangers; for all their vinous liquors were medicated by boiling before they were laid up in order to be kept.

PERSECUTION, is any pain or affliction which a person designedly inflicts upon another; and in a more restrained sense, the sufferings of Christians on account of their religion.

Historians usually reckon ten general persecutions, the first of which was under the emperor Nero, 31 years after our Lord's ascension; when that emperor having set

ſet fire to the city of Rome, threw the odium of that execrable action on the Chriſtians, who under that pretence were wrapped up in the ſkins of wild beaſts, and worried and devoured by dogs; others were crucified, and others burnt alive. The ſecond was under Domitian, in the year 95. In this perſecution St John the apoſtle was ſent to the iſle of Patmos, in order to be employed in digging in the mines. The third began in the third year of Trajan, in the year 100, and was carried on with great violence for ſeveral years. The fourth was under Antoninus the philoſopher, when the Chriſtians were baniſhed from their houſes, forbidden to ſhow their heads, reproached, beaten, hurried from place to place, plundered, impriſoned, and ſtoned. The fifth began in the year 197, under the emperor Severus. The ſixth began with the reign of the emperor Maximinus in 235. The ſeventh, which was the moſt dreadful perſecution that had ever been known in the church, began in the year 250, in the reign of the emperor Decius, when the Chriſtians were in all places driven from their habitations, ſtripped of their eſtates, tormented with racks, &c. The eighth began in the year 257, in the fourth year of the reign of the emperor Valerian. The ninth was under the emperor Aurelian, A. D. 274; but this was very inconſiderable: and the tenth began in the 19th year of Diocleſian, A. D. 303. In this dreadful perſecution, which laſted ten years, houſes filled with Chriſtians were ſet on fire, and whole droves were tied together with ropes and thrown into the ſea. See TOLERATION.

PERSEES, the deſcendants of a colony of ancient Perſians, who took refuge at Bombay, Surat, and in the vicinity of thoſe cities, when their own country was conquered 1100 years ago by the Mahometan Arabs. They are a gentle, quiet, and induſtrious people, loved by the Hindoos, and living in great harmony among themſelves. The conſequence is, that they multiply exceedingly, whilſt their countrymen in the province of Kerman are viſibly diminiſhing under the yoke of the Mahometan Perſians. Of the manners and cuſtoms of this amiable race, we have the following account in Heron's elegant tranſlation of Niebuhr's Travels.

"The Perſees (ſays he) make common contributions for the aid of their poor, and ſuffer none of their number to aſk alms from people of a different religion. They are equally ready to employ their money and credit to ſcreen a brother of their fraternity from the abuſes of juſtice. When a Perſee behaves ill, he is expelled from their communion. They apply to trade, and exerciſe all ſorts of profeſſions.

"The Perſees have as little knowledge of circumciſion as the Hindoos. Among them, a man marries only one wife, nor ever takes a ſecond, unleſs when the firſt happens to be barren. They give their children in marriage at ſix years of age; but the young couple continue to live ſeparate, in the houſes of their parents, till they attain the age of puberty. Their dreſs is the ſame as that of the Hindoos, except that they wear under each ear a tuft of hair, like the modern Perſians. They are much addicted to aſtrology, although very little ſkilled in aſtronomy.

"They retain the ſingular cuſtom of expoſing their dead to be eaten by birds of prey, inſtead of interring or burning them. I ſaw (continues our author) on a hill at Bombay a round tower, covered with planks of wood, on which the Perſees lay out their dead bodies. When the fleſh is devoured, they remove the bones into two chambers at the bottom of the tower.

"The Perſees, followers of the religion of Zerduſt or Zoroaſter, adore one God only, eternal and almighty. They pay, however, a certain worſhip to the ſun, the moon, the ſtars, and to fire, as viſible images of the inviſible divinity. Their veneration for the element of fire induces them to keep a ſacred fire conſtantly burning, which they feed with odoriferous wood, both in the temples, and in the houſes of private perſons who are in eaſy circumſtances. In one of their temples at Bombay, I ſaw a fire which had burnt unextinguiſhed for two centuries. They never blow out a light, leſt their breath ſhould ſoil the purity of the fire. See POLYTHEISM.

"The religion of the Perſees enjoins purifications as ſtrictly as that of the Hindoos. The diſciples of Zerduſt are not, however, obliged to abſtain from animal food. They have accuſtomed themſelves to refrain from the fleſh of the ox, becauſe their anceſtors promiſed the Indian prince who received them into his dominions never to kill horned cattle. This promiſe they continue to obſerve under the dominion of Chriſtians and Mahometans. The horſe is by them conſidered as the moſt impure of all animals, and regarded with extreme averſion.

"Their feſtivals, denominated *Ghumbars*, which return frequently, and laſt upon each occaſion five days, are all commemorations of ſome part of the work of creation. They celebrate them not with ſplendour, or with any particular ceremonies, but only dreſs better during thoſe five days, perform ſome acts of devotion in their houſes, and viſit their friends."

The Perſees were till lately but very little known: the ancients ſpeak of them but ſeldom, and what they ſay ſeems to be dictated by prejudice. On this account Dr Hyde, who thought the ſubject both curious and intereſting, about the end of the 17th century attempted a deeper inveſtigation of a ſubject which till then had been but very little attended to. He applied to the works of Arabian and Perſian authors, from whom, and from the relations of travellers, together with a variety of letters from perſons in India, he compiled his celebrated work on the religion of the Perſees. Other accounts have been given by different men, as accident put information in their way. But the moſt diſtinguiſhed is by M. Anquetil du Perron, who undertook a voyage to diſcover and tranſlate the works attributed to Zoroaſter. Of this voyage he drew up an account himſelf, and read it before the Royal Academy of Sciences at Paris in May 1761. A tranſlation of it was made and publiſhed in the Gentleman's Magazine for 1762, to which we refer our readers. The account begins at page 373, and is concluded at page 614. Remarks were afterwards made on Du Perron's account by a Mr Yates. See the ſame Magazine for 1766, p. 529.

PERSEPOLIS, formerly the capital of Perſia, ſituated in N. Lat. 30. 30. E. Long. 84. 0. now in ruins, but remarkable for the moſt magnificent remains of a palace or temple that are to be found throughout the world.—This city ſtood in one of the fineſt plains in Perſia, being 18 or 19 leagues in length, and in ſome places

Plate CCCCIX.

Persepolis. places two, in some four, and in others six leagues in breadth. It is watered by the great river Araxes, now Bendemir, and by a multitude of rivulets besides. Within the compass of this plain, there are between 1000 and 1500 villages, without reckoning those in the mountains, all adorned with pleasant gardens, and planted with shady trees. The entrance of this plain on the west side has received as much grandeur from nature, as the city it covers could do from industry or art. It consists of a range of mountains steep and high, four leagues in length, and about two miles broad, forming two flat banks, with a rising terrace in the middle, the summit of which is perfectly plain and even, all of native rock. In this there are such openings, and the terraces are so fine and so even, that one would be tempted to think the whole the work of art, if the great extent, and prodigious elevation thereof, did not convince one that it is a wonder too great for aught but nature to produce. Undoubtedly these banks were the very place where the advanced guards from Persepolis took post, and from which Alexander found it so difficult to dislodge them. One cannot from hence descry the ruins of the city, because the banks are too high to be overlooked; but one can perceive on every side the ruins of walls and of edifices, which heretofore adorned the range of mountains of which we are speaking. On the west and on the north this city is defended in the like manner: so that considering the height and evenness of these banks, one may safely say, that there is not in the world a place so fortified by nature.

The mountain Rehumut, in the form of an amphitheatre, encircles the palace, which is one of the noblest and most beautiful pieces of architecture remaining of all antiquity. Authors and travellers have been exceedingly minute in their descriptions of those ruins; and yet some of them have expressed themselves so differently from others, that, had they not agreed with respect to the latitude and longitude of the place, one would be tempted to suspect that they had visited different ruins. These ruins have been described by Garcias de Silva Figueroa, Pietro de la Valle, Chardin, Le Brun, and Mr Francklin. We shall adopt the description of an intelligent traveller. The ascent to the columns is by a grand staircase of blue stone containing 104 steps.

"The first object that strikes the beholder on his entrance, are two portals of stone, about 50 feet in height each; the sides are embellished with two sphinxes of an immense size, dressed out with a profusion of bead-work, and, contrary to the usual method, they are represented standing. On the sides above are inscriptions in an ancient character, the meaning of which no one hitherto has been able to decypher.

"At a small distance from these portals you ascend another flight of steps, which lead to the grand hall of columns. The sides of this staircase are ornamented with a variety of figures in basso relievo; most of them have vessels in their hands: here and there a camel appears, and at other times a kind of triumphal car, made after the Roman fashion; besides these are several led horses, oxen, and rams, that at times intervene and diversify the procession. At the head of the staircase is another basso relievo, representing a lion seizing a bull; and close to this are other inscriptions in ancient characters. On getting to the top of this staircase, you enter what was formerly a most magnificent hall; the natives have given this the name of *chehul minar*, or forty pillars; and though this name is often used to express the whole of the building, it is more particularly appropriated to this part of it. Although a vast number of ages have elapsed since the foundation, 15 of the columns yet remain entire; they are from 70 to 80 feet in height, and are masterly pieces of masonry: their pedestals are curiously worked, and appear little injured by the hand of time. The shafts are enfluted up to the top, and the capitals are adorned with a profusion of fretwork.

"From this hall you proceed along eastward, until you arrive at the remains of a large square building, to which you enter through a door of granite. Most of the doors and windows of this apartment are still standing; they are of black marble, and polished like a mirror: on the sides of the doors, at the entrance, are bas-reliefs of two figures at full length; they represent a man in the attitude of stabbing a goat: with one hand he seizes hold of the animal by the horn, and thrusts a dagger into his belly with the other; one of the goat's feet rests upon the breast of the man, and the other upon his right arm. This device is common throughout the palace. Over another door of the same apartment is a representation of two men at full length; behind them stands a domestic holding a spread umbrella: they are supported by large round staffs, appear to be in years, have long beards, and a profusion of hair upon their heads.

"At the south-west entrance of this apartment are two large pillars of stone, upon which are carved four figures; they are dressed in long garments, and hold in their hands spears 10 feet in length. At this entrance also the remains of a staircase of blue stone are still visible. Vast numbers of broken pieces of pillars, shafts, and capitals, are scattered over a considerable extent of ground, some of them of such enormous size, that it is wonderful to think how they could have been brought whole, and set up together. Indeed, every remains of these noble ruins indicate their former grandeur and magnificence, truly worthy of being the residence of a great and powerful monarch."

These noble ruins are now the shelter of beasts and birds of prey. Besides the inscriptions above mentioned, there are others in Arabic, Persian, and Greek. Dr Hyde observes, that the inscriptions are very rude and clumsy; and that some, if not all of them, are in praise of Alexander the Great; and therefore are later than that conqueror. See the article RUINS.

Perseverance. PERSEVERANCE, in *Theology*, a continuance in a state of grace to a state of glory.

About this subject there has been much controversy in the Christian church. All divines, except Unitarians, admit, that no man can be ever in a state of grace without the co-operation of the spirit of God; but the Calvinists and Arminians differ widely as to the nature of this co-operation. The former, at least such as call themselves the *true disciples of Calvin*, believe, that those who are once under the influence of divine grace can never fall totally from it, or die in mortal sin. The Arminians, on the other hand, contend, that the whole of this life is a state of probation; that without the grace of God we can do nothing that is good; that the Holy Spirit assists, but does not overpower, our natural faculties;

Perſeverance || Perſia.

faculties; and that a man, at any period of his life, may reſiſt, grieve, and even quench, the ſpirit. See THEOLOGY.

PERSEUS was the moſt ancient of all the Greek heroes. He founded the city of Mycenæ, of which he became afterwards king, and where he and his poſterity reigned for 100 years. He flouriſhed, according to moſt chronologiſts, 1348 B. C.; but, according to Sir Iſaac Newton, only 1028.

PERSEUS. See ASTRONOMY *Index*.

1 Extent of Perſia.

PERSIA, a moſt ancient and celebrated empire of Aſia, extending in length from the mouth of the river Araxes to that of the river Indus, about 1840 of our miles, and in breadth from the river Oxus, to the Perſian gulf, about 1080 of the ſame miles. It is bounded on the north by the Caſpian ſea, the river Oxus, and Mount Caucaſus; on the eaſt, by the river Indus and the dominions of the Great Mogul; on the ſouth, by the Perſian gulf and the Indian ocean; and on the weſt, by the dominions of the Grand Signior.

2 Perſia properly the name of only one province of this vaſt empire.

We learn from Sir William Jones, the illuſtrious preſident of the Aſiatic Society, that Perſia is the name of only one province of this extenſive empire, which by the preſent natives, and all the learned *Muſſulmans* who reſide in the Britiſh territories in India, is called *Irân*. It has been a practice not uncommon in all ages to denominate the whole of a country from that part of it with which we are beſt acquainted; and hence have the Europeans agreed to call Irân by the name of that province of which Shirauz is the capital: See SHIRAUZ. The ſame learned writer is confident that Irân, or Perſia in its largeſt extent, comprehended within its outline the lower Aſia, which, ſays he, was unqueſtionably a part of the *Perſian*, if not of the old Aſſyrian empire. "Thus may we look on Irân as the nobleſt peninſula on this habitable globe; and if M. Bailly had fixed on it as the *Atlantis* of PLATO, he might have ſupported his opinion with far ſtronger arguments than any that he has adduced in favour of *Nova Zembla*. If, indeed, the account of the Atlantis be not purely an Egyptian fable, I ſhould be more inclined, ſays Sir William, to place them in Irân than in any region with which I am acquainted."

3 Various names of the country.

The moſt ancient name, however, of this country was that of *Elam*, or, as ſome write it, *Ælam*, from Elam the ſon of Shem, from whom its firſt inhabitants are deſcended. Herodotus calls its inhabitants *Cephenes*; and in very ancient times the people are ſaid to have called themſelves *Artæi*, and the country where they dwelt *Artæa*. In the books of Daniel, Eſdras, &c. it is called by the names of *Pars*, *Pharas*, or *Fars*, whence the modern name of *Perſia*; but whence thoſe names have been derived, is now uncertain.

4 Opinions reſpecting its firſt population.

That Perſia was originally peopled by Elam the ſon of Shem, has been very generally admitted; but the truth is, that of the ancient hiſtory of this diſtinguiſhed empire very little is perfectly known. For this ignorance, which at firſt ſeems ſtrange, ſatiſfactory reaſons may eaſily be aſſigned; of which the principal are the ſuperficial knowledge of the *Greeks* and *Jews*, and the loſs of Perſian archives or hiſtorical compoſitions. "That the Grecian writers before XENOPHON had *no* acquaintance with *Perſia*, and that their accounts of it are wholly fabulous, is a paradox too extravagant to be ſeriouſly mentioned; but (ſays Sir William Jones) their connection with it in war or peace had been generally confined to bordering kingdoms under feudatory princes; and the firſt *Perſian* emperor, whoſe life and character they ſeem to have known with tolerable accuracy, was the great CYRUS." Our learned author, however, is ſo far from conſidering Cyrus as the firſt Perſian monarch, that he thinks it evident a powerful monarchy had ſubſiſted in Irân for ages before the acceſſion of that hero; that this monarchy was called the *Mahâbâdian* dynaſty; and that it was in fact the oldeſt monarchy in the world. The evidence upon which the preſident reſts this opinion, is the work of a Mahometan traveller, compiled from the books of ſuch Perſians as fled from their country upon the innovation in religion made by Zoroaſter: and if theſe books, of which a few ſtill remain, be genuine, and the Mahometan a faithful compiler, facts of which Sir William has not the ſmalleſt doubt, the evidence is certainly ſufficient to bear the ſuperſtructure which he has raiſed upon it.

5 Perhaps the original ſeat of the human race.

If the Perſian monarchy was thus ancient, it is natural to ſuppoſe that Perſia or Irân was the original ſeat of the human race, whence colonies were ſent out or emigrated of themſelves to people the reſt of the habitable globe. This ſuppoſition is actually made by our ingenious author, who ſtrongly confirms it by remarks on the moſt ancient language of Perſia, which he ſhows to have been the parent of the *Sanſcrit*, as well as of the Greek, Latin, and Gothic (ſee PHILOLOGY). He therefore holds, as a propoſition firmly eſtabliſhed, "that *Irân* or Perſia, in its largeſt ſenſe, was the true centre of population, of knowledge, of languages, and of arts; which inſtead of travelling weſtward only, as it has been fancifully ſuppoſed, or eaſtward, as might with equal reaſon have been aſſerted, were expanded in all directions to all the regions of the world." He thinks it is from good authority that the Saxon Chronicle brings the firſt inhabitants of Britain from Armenia; that the Goths have been concluded to come from Perſia; and that both the Iriſh and old Britons have been ſuppoſed to have proceeded from the borders of the Caſpian: for all theſe places were comprehended within the ancient Irân.

6 Accounts of the birth, &c. of Cyrus.

Of this firſt Perſian monarchy we have no hiſtorical accounts; and muſt therefore, after having thus mentioned it, deſcend at once to the era of Cyrus. This prince is celebrated both by ſacred and profane hiſtorians; but the latter are at no ſmall variance concerning his birth and acceſſion to the throne. According to Herodotus, Aſtyages, the laſt king of the Medes, being warned in a dream, that the ſon who was to be born of his daughter Mandane, ſhould one day be lord of Aſia, reſolved to marry her, not to a Mede, but to a Perſian. Accordingly he choſe for her huſband one Cambyſes, a man of a peaceable diſpoſition, and of no very high ſtation. However, about a year after they were married, Aſtyages was frightened by another dream, which made him reſolve to diſpatch the infant as ſoon as it ſhould be born. Hereupon the king ſent for his daughter, and put her under confinement, where ſhe was ſoon after delivered of a ſon. The infant was committed to the care of one Harpagus, with ſtrict orders to deſtroy it in what manner he thought proper. But he, having acquainted his wife with the command he had received, by her advice gave it to a ſhepherd, deſiring him to let it periſh by expoſing it. But the

ſhepherd, out of compaſſion, expoſed a ſtill-born child which his wife happened to be then delivered of, and brought up the ſon of Mandane as his own, giving him the name of CYRUS.

When the young prince had attained the age of ten years, as he was one day at play with other children of the ſame age, he was choſen king by his companions; and having, in virtue of that dignity, divided them into ſeveral orders and claſſes, the ſon of Artembares, a lord of eminent dignity among the Medes, refuſed to obey his orders; whereupon Cyrus cauſed him to be ſeized, and whipped very ſeverely. The boy ran crying to his father; and he immediately haſtened to the king's palace, loudly complaining of the affront his ſon had received from the ſon of a ſlave, and intreating Aſtyages to revenge, by ſome exemplary puniſhment, the indignity offered to him and his family. Aſtyages, commanding both the herdſman and his ſon to be brought before him, aſked the latter, how he, who was the ſon of ſo mean a man, had dared to abuſe the ſon of one of the chief lords of the kingdom? Cyrus replied, that he had done no more than he had a right to do; for the boys of the neighbourhood having choſen him king, becauſe they thought him moſt worthy of that dignity, and performed what he, veſted with that character, had commanded, the ſon of Artembares alone had ſlighted his orders, and for his diſobedience had ſuffered the puniſhment he deſerved. In the courſe of this converſation Aſtyages happening to recollect, that his grandſon, whom he had ordered to be deſtroyed, would have been about the ſame age with Cyrus, began to queſtion the ſhepherd concerning his ſuppoſed ſon, and at laſt obtained from him a confeſſion of the whole truth.

Aſtyages having now diſcovered Cyrus to be his grandſon, ſent for Harpagus, who alſo confeſſed that he had not ſeen Mandane's ſon deſtroyed, but had given him to the ſhepherd; at which Aſtyages was ſo much incenſed, that, having invited Harpagus to an entertainment, he cauſed him to be ſerved with the fleſh of his own ſon. When he had done, the king aſked him whether he liked his victuals; and Harpagus anſwering, that he had never taſted any thing more delicious, the officers appointed for that purpoſe brought in a baſket, containing the head, hands, and feet of his ſon, deſiring him to uncover the baſket, and take what he liked beſt. He did as they deſired, and beheld the mangled remains of his only child without betraying the leaſt concern, ſo great was the command which he had over his paſſions. The king then aſked him, whether he knew with what kind of meat he had been entertained. Harpagus replied, that he knew very well, and was always pleaſed with what his ſovereign thought fit to ordain; and having thus replied, with a ſurpriſing temper he collected the mangled parts of his innocent ſon, and went home.

Aſtyages having thus vented his rage on Harpagus, began next to conſult what he ſhould do with Cyrus. The magi, however, eaſed him of his fears with regard to him, by aſſuring him, that as the boy had been once choſen king by his companions, the dream had been already verified, and that Cyrus never would reign in any other ſenſe. The king, being well pleaſed with this anſwer, called Cyrus, and, owning how much he had been wanting in the affection which he ought to have had towards him, deſired him to prepare for a journey into Perſia, where he would find his father and mother in circumſtances very different from thoſe of the poor ſhepherd and his wife with whom he had hitherto lived. Cyrus, on his arrival at his father's houſe, was received with the greateſt joy. When he grew up, he ſoon became popular on account of his extraordinary parts; till at laſt his friendſhip was courted by Harpagus, who had never forgot the cruel treatment he received from Aſtyages. By his means a conſpiracy was formed againſt Aſtyages; who being overthrown in two ſucceſſive engagements, was taken priſoner and confined for life.

The account given by Xenophon of the riſe of Cyrus is much more conſonant to Scripture; for he tells us, that Babylon was conquered by the united forces of the Medes and Perſians.* According to him, Cyrus was the ſon of Cambyſes king of the Medes, and Mandane the daughter of Aſtyages king of Perſia. He was born a year after his uncle Cyaxares, the brother of Mandane. He lived till the age of twelve with his parents in Perſia, being educated after the manner of the country, and inured to fatigues and military exerciſes. At this age he was taken to the court of Aſtyages, where he reſided four years; when the revolt of the Medes and Perſians from the Babylonians happened, and which ended in the deſtruction of the Babyloniſh empire, as related under the article BABYLON.

7 His war with the Lydians.

While Cyrus was employed in the Babyloniſh war, before he attacked the metropolis itſelf, he reduced all the nations of Aſia Minor. The moſt formidable of theſe were the Lydians, whoſe king Crœſus aſſembled a very numerous army, compoſed of all the other nations in that part of Aſia, as well as of Egyptians, Greeks, and Thracians. Cyrus being informed of theſe vaſt preparations, augmented his forces to 196,000 men, and with them advanced againſt the enemy, who were aſſembled near the river Pactolus. After long marches, he came up with them at Thymbra, not far from Sardis, the capital of Lydia. Beſides the horſe and foot, which amounted to 196,000, as already obſerved, Cyrus had 300 chariots armed with ſcythes, each chariot drawn by four horſes abreaſt, covered with trappings that were proof againſt all ſorts of miſſive weapons: he had likewiſe a great number of chariots of a larger ſize, upon each of which was placed a tower about 18 or 20 feet high, and in each tower were lodged 20 archers. Theſe towers were drawn by 16 oxen yoked abreaſt. There was moreover a conſiderable number of camels, each mounted by two Arabian archers, the one looking towards the head, and the other towards the hinder part of the camel. The army of Crœſus conſiſted of 420,000 men. The Egyptians, who alone were 120,000 in number, being the main ſtrength of the army, were placed in the centre. Both armies were drawn up in an immenſe plain, which gave room for the extending of the wings on either ſide; and the deſign of Crœſus, upon which alone he founded his hopes of victory, was to ſurround and hem in the enemy's army.

8 The battle of Thymbra.

When the two armies were in ſight of each other, Crœſus, obſerving how much his front exceeded that of Cyrus, made the centre halt, but commanded the two wings to advance, with a deſign to incloſe the Perſian army, and begin the attack on both ſides at once. When the two detached bodies of the Lydian forces were ſufficiently extended, Crœſus gave the ſignal to the main

main body, which marched up to the front of the Perſian army, while the two wings attacked them in flank; ſo that Cyrus's army was hemmed in on all ſides, and, as Xenophon expreſſes it, was incloſed like a ſmall ſquare drawn within a great one. This motion, however, did not at all alarm the Perſian commander; but, giving his troops the ſignal to face about, he attacked in flank thoſe forces that were going to fall upon his rear ſo vigorouſly, that he put them into great diſorder. At the ſame time a ſquadron of camels was made to advance againſt the enemy's other wing, which conſiſted moſtly of cavalry. The horſes were ſo frightened at the approach of theſe animals, that moſt of them threw their riders, and trod them under foot; which occaſioned great confuſion. Then Artageſes, an officer of great valour and experience, at the head of a ſmall body of horſe, charged them ſo briſkly, that they could never afterwards rally; and at the ſame time the chariots, armed with ſcythes, being driven in among them, they were entirely routed. Both the enemy's wings being thus put to flight, Cyrus commanded his chief favourite Abradates to fall upon the centre with the large chariots above mentioned. The firſt ranks, conſiſting moſtly of Lydians, not being able to ſtand ſo violent a charge, immediately gave way; but the Egyptians, being covered with their bucklers, and marching ſo cloſe that the chariots had not room to penetrate their ranks, a great ſlaughter of the Perſians enſued. Abradates himſelf was killed, his chariot overturned, and the greateſt part of his men were cut in pieces. Upon his death, the Egyptians, advancing boldly, obliged the Perſian infantry to give way, and drove them back quite to their engines. There they met with a new ſhower of darts and javelins from their machines; and at the ſame time the Perſian rear advancing ſword in hand, obliged their ſpearmen and archers to return to the charge. In the mean time Cyrus, having put to flight both the horſe and foot on the left of the Egyptians, puſhed on to the centre, where he had the misfortune to find his Perſians again giving ground; and judging that the only way to ſtop the Egyptians, who were purſuing them, would be to attack them in the rear, he did ſo; and at the ſame time the Perſian cavalry coming up to his aſſiſtance, the fight was renewed with great ſlaughter on both ſides. Cyrus himſelf was in great danger; for his horſe being killed under him, he fell among the midſt of his enemies; but the Perſians, alarmed at the danger of their general, threw themſelves headlong on their opponents, reſcued him, and made a terrible ſlaughter; till at laſt Cyrus, admiring the valour of the Egyptians, offered them honourable conditions: letting them know at the ſame time, that all their allies had abandoned them. They accepted the terms offered them; and having agreed with Cyrus that they ſhould not be obliged to carry arms againſt Crœſus, they engaged in the ſervice of the conqueror, and continued faithful to him ever after.

9 Sardis taken, and the Lydian empire overthrown.

The next morning Cyrus advanced towards Sardis, and Crœſus marched out to oppoſe him at the head of the Lydians only: for his allies had all abandoned him. Their ſtrength conſiſted moſtly in cavalry; which Cyrus being well appriſed of, he ordered his camels to advance; by whom the horſes were ſo frightened, that they became quite ungovernable. However, the Lydians diſmounted, and for ſome time made a vigorous reſiſtance on foot; but were at laſt driven into the city, which was taken two days after: and thus the Lydian empire was totally deſtroyed.

10 Reduces Babylon.

After the conqueſt of Sardis, Cyrus turned his arms againſt Babylon itſelf, which he reduced in the manner related under that article. Having ſettled the civil government of the conquered kingdoms, Cyrus took a review of all his forces, which he found to conſiſt of 600,000 foot, 120,000 horſe, and 2000 chariots armed with ſcythes. With theſe he extended his dominion all over the nations to the confines of Ethiopia, and to the Red ſea; after which he continued to reign peaceably over his vaſt empire till his death, which happened about 529 before Chriſt. According to Xenophon, he died a natural death; but others tell us, that, having engaged in a war with the Scythians, he was by them overthrown and cut in pieces with his whole army, amounting to 200,000 men. But this is very improbable, ſeeing all authors agree that the tomb of Cyrus was extant at Paſargada in Perſia in the time of Alexander the Great; which it could not have been if his body had remained in the poſſeſſion of the Scythians, as theſe authors aſſert.

11 His death.

In the time of Cyrus, the Perſian empire extended from the river Indus to the Ægean ſea. On the north it was bounded by the Euxine and Caſpian ſeas, and on the ſouth by Ethiopia and Arabia. That monarch kept his reſidence for the ſeven cold months at Babylon, by reaſon of the warmth of that climate; three months in the ſpring he ſpent at Suſa, and two at Ecbatan during the heat of ſummer. On his deathbed he appointed his ſon Cambyſes to ſucceed him in the empire; and to his other ſon, Smerdis, he gave ſeveral conſiderable governments. The new monarch immediately ſet about the conqueſt of Egypt; which he accompliſhed in the manner related in the hiſtory of that country.

12 Cambyſes conquers Egypt.

Having reduced Egypt, Cambyſes next reſolved to turn his arms againſt the Carthaginians, Hammonians, and Ethiopians. But he was obliged to drop the firſt of theſe enterpriſes, becauſe the Phœnicians refuſed to ſupply him with ſhips againſt the Carthaginians, who were a Phœnician colony. However, he ſent ambaſſadors into Ethiopia with a deſign to get intelligence of the ſtate and ſtrength of the country. But the Ethiopian monarch, being well appriſed of the errand on which they came, treated them with great contempt. In return for the preſents ſent him by Cambyſes, he ſent his own bow; and adviſed the Perſians to make war upon the Ethiopians when they could bend ſuch a ſtrong bow as eaſily as he did, and to thank the gods that the Ethiopians had no ambition to extend their dominions beyond their own country.

13 His unſucceſsful expedition againſt Ethiopia and the Hammonians.

Cambyſes was no ſooner informed of this anſwer by his ambaſſadors than he flew into a violent paſſion; and ordered his army immediately to begin their march, without conſidering that they were neither furniſhed with proviſions nor any other neceſſary. When he arrived at Thebes in Upper Egypt, he detached 50,000 men, with orders to deſtroy the temple of Jupiter Ammon: but all theſe periſhed in the deſert; not a ſingle perſon arriving either at the oracle, or returning to Thebes. The reſt of the army, led by Cambyſes himſelf, experienced incredible hardſhips; for not being provided with any neceſſaries, they had not marched a fifth part of the way when they were obliged to kill and eat

Persia. eat their beasts of burthen. When these failed, the soldiers fed on grass and roots, as long as any could be found; and at last were reduced to the dreadful necessity of eating one another; every tenth man, on whom the lot fell, being condemned to serve as food for his companions. The king, however, obstinately persisted in his design; till, being apprehensive of the danger he himself was in, he retreated to Thebes, after having lost the greatest part of his army.

14 He murders his brother. Cambyses was a man of a very cruel and suspicious temper, of which he gave many instances; and the following proved indirectly the cause of his death.—We have already observed that the king of Ethiopia sent his bow in return for the presents brought to him by the ambassadors of Cambyses. The only man in the Persian army who could bend this bow was Smerdis the king's brother; and this instance of his personal strength so alarmed the tyrant, that, without any crime alleged, he caused him to be murdered. This gave occasion to one Smerdis, a magian, who greatly resembled the other Smerdis in looks, to assume the name of the deceased prince, and to raise a rebellion against Cambyses, who was generally hated for his cruelty; and this he could the more easily do, as the chief management of affairs had been committed to this Smerdis during the king's absence. Cambyses, on receiving the news of this revolt, immediately ordered his army to march, in order to suppress it; but as he was mounting his horse, his sword, slipping out of its scabbard, wounded him in the thigh. On this accident, he asked the name of the city where he was; and being told that it was Ecbatan, he said in the presence of all his attendants, "Fate has decreed that Cambyses the son of Cyrus shall die in this place." For, having consulted the oracle of Butus, which was very famous in that country, he was told that he should die at Ecbatan. This he had always understood of Ecbatan in Media, and had therefore resolved to avoid it. Being now, however, convinced that his end approached, he assembled the chief Persian lords who served in the army, and having told them that his brother was certainly dead, he exhorted them never to submit to the impostor, or suffer the sovereignty again to pass from the Persians to the Medes, to which nation Smerdis belonged, but to use their utmost endeavours to place one of their own blood on the throne.

15 His death. As the king's wound mortified, he lived but a few days after this; but the assembly supposing that he had spoken only out of hatred to his brother, quietly submitted to the impostor, who was thus for a time established on the throne. Indeed, from his conduct during the short time which he enjoyed the kingdom, he appears to have been not at all undeserving of a crown.

16 Reign of Smerdis the magian. He began with granting to all his subjects an exemption from taxes and military service for three years, and treated all of them in the most beneficent manner. To secure himself on the throne the more effectually, he married Atossa the daughter of Cyrus; thinking, that in case of a discovery he might hold the empire by her title. She had before been married to her brother Cambyses, on a decision of the magi that a king of Persia might do as he pleased; and by virtue of this decision Smerdis also married her as her brother. The extreme caution of Smerdis, however, promoted the discovery of his imposture. He had married all his predecessor's wives, among whom was one Phedyma, the daughter of Otanes a Persian nobleman of the first rank. Otanes, 17 His imposture discovered. who suspected that the king was not Smerdis the son of Cyrus, sent a trusty messenger to his daughter, desiring to know whether he was so or not; but Phedyma, having never seen this Smerdis, could not give any answer. Her father then desired her to inquire at Atossa, who could not but know her own brother. However, he was again disappointed; for Phedyma acquainted him that all the king's wives were lodged in distinct and separate apartments, without being allowed to see each other. This greatly increased the suspicions of Otanes; upon which he sent his daughter a third message, desiring her, the next time she should be admitted to the king's bed, to take an opportunity of feeling whether he had ears or not: for Cyrus had formerly caused the ears of Smerdis the magian to be cut off for some crime of which he had been guilty; so that, if the king had ears, she might then be assured that he was Smerdis the son of Cyrus. The event showed that the suspicions of Otanes were just; and Phedyma having acquainted her father that the king had no ears, a conspiracy was immediately formed against him. 18 A conspiracy formed against him. While the conspirators were debating about the proper means of carrying their designs into execution, Darius the son of Hystaspes happening to arrive at Susa where his father was governor, they all agreed to make him privy to their design. He told them, at their first meeting, that he thought nobody in the empire but himself had known that Smerdis the son of Cyrus was dead, and the throne usurped by one of the magi; that he had come with a design to kill the usurper, without imparting his design to any one, that the glory of such an action might be entirely his own. But since others were apprised of the imposture, he insisted that the usurper should be dispatched without delay. Otanes, on the other hand, was for putting off the enterprise till some better opportunity offered; but Darius protested, that if they did not make the attempt that very day, he would prevent any one from accusing him, by disclosing the whole matter to the impostor himself.

In the mean time, Smerdis and his brother had by great promises prevailed on Prenaspes (the executioner of the true Smerdis) to bind himself by an oath not to discover the fraud they had put on the Persians, and even to make a public speech, declaring that the present king of Persia was really the son of Cyrus. At the time appointed, he began his discourse with the genealogy of Cyrus, putting his hearers in mind of the great favours the nation had received from that prince. After having extolled Cyrus and his family, to the great astonishment of all present, he confessed the whole transaction with regard to the death of Smerdis; telling the people, that the apprehensions of the danger he must inevitably run by publishing the imposture had constrained him to conceal it so long; but now, not being able any longer to act such a dishonourable part, he acknowledged that he had been compelled by Cambyses to put his brother to death with his own hand, and that the person who possessed the throne was Smerdis the magian. He then begged pardon of the gods and men for the crime he had committed; and fulminating many imprecations against the Persians if they failed to recover

ver the ſovereignty, he threw himſelf headlong from the top of the tower on which he ſtood, and died on the ſpot.

19 He is killed.

In the mean time the conſpirators, who were advancing towards the palace, were informed of what had happened; and Otanes was again for deferring the execution of their enterpriſe: but Darius inſiſting upon the danger of delay, they proceeded boldly to the palace; and being admitted by the guards, who did not ſuſpect them, they killed both the uſurper and his brother; after which they expoſed their heads to the people, and declared the whole impoſture. The Perſians at this were ſo enraged, that they fell on the whole ſect, and killed every one of the magi they could meet with; and had not the ſlaughter been ſtopped by night, not one of the order would have been left alive. The day on which this ſlaughter happened was afterwards celebrated by the Perſians with the greateſt ſolemnity, and called by the name of *Magophonia*, or *the ſlaughter of the Magi*. On that feſtival the magi durſt not appear abroad, but were obliged to ſhut themſelves up in their houſes. Smerdis the magian reigned only eight months.

When the tumult was a little ſubſided, the conſpirators, who were ſeven in number, met together in order to elect a new king, or to determine what form of government they ſhould next introduce. Otanes was for a republic; but being overruled by the reſt, he declared, that as he was determined not to be a king, neither would he be ruled by one; and therefore inſiſted that he and his family ſhould ever afterwards remain free from ſubjection to the royal power. This was not only granted, but it was further agreed by the other ſix, that whoever was choſen ſhould every year preſent Otanes with a Median veſt, a mark of great diſtinction among the Perſians, becauſe he had been the chief author of the enterpriſe. They further agreed to meet at a certain place next morning at ſunriſe on horſeback, and that he whoſe horſe firſt neighed ſhould be king. This being overheard by Oebores, who had the care of Darius's horſes, he led a mare over-night to the place, and brought his maſter's horſe to her. The next morning, the horſe remembering the place, immediately neighed for the mare; and the five lords diſmounting, ſaluted Darius as their king.

20 Darius Hyſtaſpes choſen king.

Darius Hyſtaſpes was elected king of Perſia in the year 522 B. C. Immediately after his acceſſion, he promoted the other ſix conſpirators to the firſt employments in the kingdom, married the two daughters of Cyrus, Atoſſa and Artyſtona, Parmys the daughter of the true Smerdis, and Phedyma the daughter of Otanes, who had detected the impoſture of the magian. He then divided the whole empire into 20 ſatrapies or governments, and appointed a governor over each diviſion, ordering them to pay him an annual tribute. The inhabitants of Colchis, with ſome others, were enjoined only to make annual preſents, and the Arabians to furniſh every year ſuch a quantity of frankincenſe as equalled the weight of 1000 talents. Thus Darius received the yearly tribute of 14,560 Eubœic talents, upwards of 260,000 pounds ſterling.

Under Darius, the building of the temple of Jeruſalem, which had been obſtructed by Cambyſes and Smerdis, went on ſucceſsfully, and the Jewiſh ſtate was entirely reſtored. The moſt remarkable of Darius's other tranſactions were his expeditions againſt Babylon; againſt Scythia, India, and Greece. The expedition againſt Babylon took place in the year 517 B. C. when the people, unable to bear the oppreſſion of the Perſians, and likewiſe diſcontented becauſe the ſeat of government was removed from their city to Suſa in Perſia, took the opportunity of the troubles which happened in the reigns of Cambyſes and Smerdis, to ſtore their city with all kinds of proviſions ſufficient to ſerve them for many years; after which they broke out into an open rebellion, and this quickly brought upon them Darius with all his forces. The Babylonians perceiving themſelves ſhut up by ſo numerous an army, turned all their thoughts towards the ſupporting of a long ſiege, which they imagined would tire out the king's troops. To prevent the conſumption of their proviſions, they took the moſt barbarous and cruel reſolution that ever was put in execution by any nation. They agreed among themſelves to get rid of all unneceſſary mouths; and therefore, gathering together all the old men, women, and children, they ſtrangled them without diſtinction; every one being allowed only to keep the wife he liked beſt, and a maid-ſervant to do the work of the houſe. The ſiege continued for a year and eight months; nor was there any likelihood of its being ended, when Zopyrus, one of Darius's chief commanders, put him in poſſeſſion of it by the following ſtratagem. He cut off his noſe and ears, and having mangled his body with ſtripes in a moſt cruel manner, he fled to the Babylonians thus disfigured, pretending that he had been ſo treated by Darius for adviſing him to raiſe the ſiege. Being intruſted with the command of ſome forces, he cut off ſeveral parties of the Perſian army, whom Darius thus ſacrificed in order to raiſe the character of Zopyrus the higher among the Babylonians. In this manner he ſo much eſtabliſhed his credit, that at laſt he was made commander in chief of all the Babyloniſh forces, and the guard of the city committed entirely to his care; and no ſooner was this done than he delivered it up to Darius, who, to prevent their rebelling a ſecond time, beat down the walls of that metropolis to the height of 50 cubits. Three thouſand of the moſt active in the rebellion were impaled; the reſt pardoned. As they had deſtroyed moſt of their women, the neighbouring nations were commanded to furniſh them with wives, and 50,000 women were ſent to that city, by which means it was prevented from being depopulated. Zopyrus was rewarded with the higheſt honours, and had the whole revenues of Babylon beſtowed on him for life.

21 Revolt of the Babylonians.

After the reduction of Babylon, Darius undertook a Scythian expedition, directed againſt thoſe nations which lie between the Danube and the Tanais. His pretext for this war was, to revenge the calamities which theſe nations had brought upon Aſia about 120 years before, when they invaded and ſubdued Media; keeping it in ſubjection for the ſpace of 28 years, as we have related under that article. In this expedition he was attended with an army of 700,000 men. With theſe he marched to the Thracian Boſphorus; which having paſſed on a bridge of boats, he reduced all Thrace. From Thrace he advanced to the Danube, where he had appointed his fleet to meet him. This river he paſſed on another bridge of boats, and entered Scythia. His enemies, however, were too wiſe to oppoſe ſuch a formidable power in the open field; and therefore retired before him, waſting the

23 His unſucceſsful expedition againſt the Scythians.

Perſia.

the country as they went along, till at laſt the king, ſenſible of the danger he was in, reſolved to give over the enterpriſe and return home. In order to do ſo with ſafety, he lighted a great number of fires in the night-time, and decamped; leaving behind him the old men and the ſick, who fell into the hands of their enemies. The Scythians perceiving that Darius was gone, detached a conſiderable body to the bridge over the Danube; and as they were well acquainted with the roads, they got thither before the Perſians. The Scythians had ſent expreſſes before-hand to perſuade the Ionians, whom Darius had left to guard the bridge, to break it down and retire to their own country; and this they preſſed the more earneſtly, that as the time preſcribed by Darius was now expired, they were at liberty to return home, without breaking their word or being wanting in their duty. Miltiades, prince of the Cherſoneſus of Thrace, was for embracing ſo favourable an opportunity of cutting off Darius's retreat, and ſhaking off the Perſian yoke at once: all the other commanders agreed with him, except Hyſtiæus prince of Miletus; who repreſented to the Ionian chiefs, that their power was connected with that of Darius, ſince it was under his protection that each of them was lord in his own city; and that the cities of Ionia would not fail to depoſe them and recover their liberty, if the Perſian power ſhould ſink or decline. This ſpeech made a deep impreſſion on the reſt, and it was at laſt determined that they ſhould wait for Darius; and in order to deceive the Scythians, they began to break down the bridge, but adviſed them to return back and defeat Darius. They did ſo, but miſſed him; and he having thus ſafely eſcaped ſo great a danger, immediately repaſſed the Boſphorus, and took up his winter quarters at Sardis, leaving Megabyzus, one of his chief generals, to complete the conqueſt of Thrace.

23 He conquers India.

The king having ſufficiently refreſhed his troops who had ſuffered extremely in the Scythian expedition, began to think of extending his dominions eaſtward; and in order to facilitate his deſign, reſolved in the firſt place to diſcover thoſe countries. With this view, he cauſed a fleet to be built and equipped at Caſpatyrus, a city on the river Indus. The command of this fleet he gave to one Scylax, a Grecian of Caryandia, a city of Caria, who was well verſed in maritime affairs. Him he ordered to ſail down the current, and make the beſt diſcoveries he could of the countries lying on either ſide of the river, till he arrived at the ſouthern ocean; from whence he was to ſteer his courſe weſtward, and that way return to Perſia. Scylax, having exactly obſerved his inſtructions, and ſailed down the river Indus, entered the Red ſea by the ſtraits of Babelmandel, and on the thirtieth month from his firſt ſetting out, landed at the ſame place from whence Nechu king of Egypt formerly ſent out the Phœnicians who circumnavigated Africa. From hence Scylax returned to Suſa, where he gave a full account of his diſcoveries; upon which Darius, marching into India at the head of a powerful army, reduced that large country, and made it a province of the Perſian empire, drawing from thence an annual tribute of 360 talents of gold.

24 Revolt of the Ionians, &c.

Soon after the expedition of Darius againſt India happened the revolt of the Ionians, which gave occaſion to his expedition into Greece; an account of which is given under the articles ATTICA, GREECE, SPARTA, &c. The ill ſucceſs which attended him here, however, was ſo far from making him drop the enterpriſe, that it only made him the more intent on reducing the Grecians; and he reſolved to head his army in perſon, having attributed his former bad ſucceſs to the inexperience of his generals. But while he was employed in making the neceſſary preparations for this purpoſe, he received intelligence that the Egyptians had revolted, ſo that he was obliged to make preparations for reducing them alſo; and before this could be done, the king died, after having reigned 36 years, leaving the throne to his ſon Xerxes.

25 Expeditions of Xerxes againſt Egypt and Greece.

This prince aſcended the throne of Perſia in the year 485 B. C.; and his firſt enterpriſe was to reduce the Egyptians; which he effectually did, bringing them into a worſe ſtate of ſlavery than they ever had experienced before. After this he reſolved on an expedition into Greece; the unfortunate event of which is related under the article ATTICA. By his misfortunes in the Grecian expedition, he became at laſt ſo diſpirited, that he thenceforth abandoned all thoughts of war and conqueſts; but growing tyrannical, and oppreſſing his ſubjects, he was murdered in his bed, in the year 464 B. C. and 21ſt of his reign; and was ſucceeded by his third ſon Artaxerxes, ſurnamed *Longimanus* on account of the great length of his arms.

26 Xerxes ſucceeded by Artaxerxes Longimanus.

This prince is named *Ahaſuerus* in Scripture, and is the ſame who married Eſther, and during the whole of his reign ſhowed the greateſt kindneſs to the Jewiſh nation. In the beginning of his reign he was oppoſed by Hyſtaſpes the ſecond ſon of Xerxes, whom, however, he overcame, though not without conſiderable difficulty. After this he applied himſelf to the ſettlement of the affairs of government, and reforming many abuſes which had crept in; and then, being fully eſtabliſhed on the throne, he appointed feaſts and rejoicings to be made for 180 days in the city of Suſa; at one of which he reſolved to divorce his queen for diſobedience; and afterwards married Eſther, as we find it recorded in the ſacred writings.

In the fifth year of the reign of Artaxerxes the Egyptians revolted anew, and, being aſſiſted by the Athenians, held out for ſix years; but were again obliged to ſubmit, and continued in ſubjection during the whole of his reign. Nothing elſe remarkable happened during the life of Artaxerxes Longimanus, who died in the 41ſt year of his reign; and was ſucceeded by Xerxes II. the only ſon he had by his queen, though by his concubines he had 17. Xerxes having drunk immoderately at an entertainment immediately after his acceſſion, retired to a chamber in order to refreſh himſelf with ſleep; but here he was murdered by Sogdianus, the ſon of Artaxerxes by one of his concubines, after he had reigned 45 days.

27 Xerxes II.

28 Sogdianus.

Sogdianus was ſcarce ſeated on the throne when he put to death Bagorazus, the moſt faithful of all his father's eunuchs; by which, and the murder of his ſovereign, he became generally odious. Upon this, ſenſible of the dangerous ſituation in which he was, he ſent for one of his brothers named *Ochus*, whom he ſuſpected, with a deſign to murder him the moment he arrived.

29 Ochus.

Ochus, however, underſtanding his deſign, put off, by ſeveral pretences, his coming, till he had drawn together a powerful army, with which he advanced to the confines of Perſia. Here he openly declared, that his deſign was to revenge his brother's death; which brought over

Perſia.

to him many of the nobility and governors of provinces, by whom he was immediately proclaimed king. Sogdianus, ſeeing himſelf thus deſerted, contrary to the advice of all his friends, came to an accommodation with Ochus; who no ſooner had him in his power than he cauſed him to be ſuffocated among aſhes; a puniſhment invented on purpoſe for him.

Ochus being firmly ſettled on the throne by the death of Sogdianus, changed his name to Darius; and is by hiſtorians commonly called *Darius Nothus*, or *The Baſtard*. But Arſites, another of the brothers, ſeeing in what manner Sogdianus had got the better of Xerxes, and been afterwards driven out by Ochus, began to entertain thoughts of treating him in the ſame manner. He was not, however, ſo ſucceſsful; for, being defeated in an engagement, he ſurrendered himſelf in hopes of mercy, but was immediately put to death by ſuffocation in aſhes. Several other perſons were executed; but theſe ſeverities did not procure him the repoſe which he expected; for his whole reign was diſturbed with violent commotions in various parts of the empire. One of the moſt dangerous was raiſed by Piſuthna, governor of Lydia; but he being deſerted by his Greek mercenaries, was at laſt overcome, and put to death: however, his ſon Amorgas continued to infeſt the maritime provinces of Aſia Minor for two years; till he alſo was taken priſoner by Tiſſaphernes, the new governor of Lydia, who put him to death. Other inſurrections quickly followed this; but the greateſt misfortune which befel Darius during the whole courſe of his reign was the revolt of the Egyptians, who could not be reduced. Before his death he inveſted Cyrus his youngeſt ſon with the ſupreme government of all the provinces of Aſia Minor. This was done through the perſuaſions of his mother Paryſatis, who had an abſolute ſway over her huſband; and ſhe procured this command for him, that he might thereby be enabled to contend for the kingdom after his father's death. She even inſiſted that the king ſhould declare him heir to the crown before he died; but this he could not by any means be induced to do. He died

30 Artaxerxes Mnemon.

in the year 405 B. C. and was ſucceeded by his ſon Artaxerxes, by the Greeks ſurnamed *Mnemon* on account of his extraordinary memory.

31 Revolt of Cyrus the Younger.

The moſt remarkable tranſaction which happened during the reign of this prince was the revolt of his brother Cyrus. This young prince had been raiſed to ſo great power through the intereſt of his mother, on purpoſe that he might revolt, as we have already ſeen. He began with gaining over the cities under the government of Tiſſaphernes; which quickly produced a war with that governor. Cyrus then began to aſſemble troops, which he pretended were deſigned only againſt Tiſſaphernes. As he had given great aſſiſtance to the Lacedæmonians in their wars againſt the Athenians, he now in return demanded aſſiſtance from them; which requeſt they very readily complied with, ordering their fleet immediately to join him, and to obey in every thing the commands of Tamos his admiral. At laſt Cyrus, having collected an army of 13,000 Greek mercenaries and 100,000 regular troops of other nations, ſet out from Sardis, directing his march towards Upper Aſia; the army being entirely ignorant of the expedition on which they were going. When they arrived at Tarſus, the Greeks, ſuſpecting that they were marching againſt the king refuſed to proceed any further; but Cyrus having gained them over with preſents and promiſes, they ſoon went on with ſatisfaction. Having arrived at Cunaxa in the province of Babylon, Cyrus found his brother with 900,000 men ready to engage him. Whereupon,

32 Battle of Cunaxa.

leaping out of his chariot, he commanded his troops to ſtand to their arms and fall into their ranks; which was done with great expedition, no time being allowed the ſoldiers to refreſh themſelves. Clearchus, the commander of the Peloponneſian troops, adviſed Cyrus not to charge in perſon, but to remain in the rear of the Greek battalions; but this advice he rejected with indignation, ſaying, that he ſhould thus render himſelf unworthy of the crown for which he was fighting. As the king's army drew near, the Greeks fell upon them with ſuch a fury, that they routed the wing oppoſite to them almoſt at the firſt onſet; upon which Cyrus was with loud ſhouts proclaimed king by thoſe who ſtood next to him. But he, in the mean time, perceiving that Artaxerxes was wheeling about to attack him in flank, advanced againſt him with 600 choſen horſe, killed Artageſes captain of the king's guards with his own hand, and put the whole body to flight. In this encounter, diſcovering his brother, he ſpurred on his horſe, and, coming up to him, engaged him with great fury; which in ſome degree turned the battle into a ſingle combat. Cyrus killed his brother's horſe, and wounded him on the ground; but he immediately mounted another horſe, when Cyrus attacked him again, gave him a ſecond wound, and had already lifted up his hand to give him a third, when the guards, perceiving the danger in which their king was, diſcharged their arrows at once againſt his antagoniſt, who at the ſame time throwing himſelf headlong upon his brother, was pierced through by his javelin. He fell dead upon the ſpot; and all the chief lords of his court, reſolving not to ſurvive him, were ſlain in the ſame place.

In the mean time, the Greeks having defeated the enemy's left wing commanded by Tiſſaphernes, and the king's right wing having put to flight Cyrus's left, both parties, being ignorant of what had paſſed elſewhere, imagined that they had gained the victory. But Tiſſaphernes acquainting the king that his men had been put to flight by the Greeks, he immediately rallied his troops, in order to attack them. The Greeks, under the command of Clearchus, eaſily repulſed them, and purſued them to the foot of the neighbouring hills. As night was drawing near, they halted at the foot of the hill, much ſurpriſed that neither Cyrus himſelf, nor any meſſenger from him, had appeared; for as yet they knew nothing of his death nor the defeat of the reſt of the army. They determined therefore to return to their camp, which they did accordingly; but found there that the greateſt part of their baggage had been plundered, and all their proviſions taken, which obliged them to paſs the night in the camp without any ſort of refreſhment. The next morning, as they were ſtill expecting to hear from Cyrus, they received the news of his death, and the defeat of that part of the army. Whereupon they ſent deputies to Ariæus, who was commander in chief of all the other forces of Cyrus, offering him, as conquerors, the crown of Perſia. Ariæus rejected the

33 Retreat of ten thouſand Greeks.

offer, and acquainting them that he intended to ſet out early in the morning on his return to Ionia, adviſed them to join him in the night. They followed his advice, and, under the conduct of Clearchus, began their march,

Perſia. march, arriving at his camp about midnight, whence they ſet out on their return to Greece. They were at a vaſt diſtance from their own country, in the very heart of the Perſian empire, ſurrounded by a victorious and numerous army, and had no means of retreat but by forcing their way through an immenſe tract of the enemy's country. But their valour and reſolution maſtered all theſe difficulties; and, in ſpite of a powerful army, which purſued and haraſſed them all the way, they made good their retreat for 2325 miles through the provinces belonging to the enemy, and got ſafe to the Greek cities on the Euxine ſea. This retreat (the longeſt that was ever made through an enemy's country) was conducted at firſt by Clearchus; but he being cut off through the treachery of Tiſſaphernes, Xenophon was choſen in his room, who at laſt brought his men ſafe into Greece: but for a full account of that famous retreat, ſee the article XENOPHON.

34 War with the Lacedæmonians. The war with Cyrus was ſcarcely ended, when another broke out with the Lacedæmonians, on the following account. Tiſſaphernes being appointed to ſucceed Cyrus in all his power, to which was added all which he himſelf poſſeſſed formerly, began to oppreſs the Greek cities in Aſia in a moſt cruel manner. On this they ſent ambaſſadors to Sparta, deſiring the aſſiſtance of that powerful republic. The Spartans having ended their long war with the Athenians, willingly laid hold of the preſent opportunity of breaking again with the Perſians, and therefore ſent againſt them an army under the command of Thimbro, who, being ſtrengthened by the forces which returned under Xenophon, took the field againſt Tiſſaphernes. But Thimbro being ſoon recalled upon ſome complaints, Dercyllidas, a brave officer and experienced engineer, was appointed to ſucceed him; and he carried on the war to much more advantage than his predeceſſor. On his arrival in Aſia, finding that Tiſſaphernes was at variance with another governor named *Pharnabazus*, he concluded a truce with the former, and marching againſt Pharnabazus, drove him quite out of Æolis, and took ſeveral cities in other parts. The latter, however, immediately repaired to the Perſian court, where he made loud complaints againſt Tiſſaphernes, but gave the king a moſt ſalutary advice, which was to equip a powerful fleet, and give the command of it to Conon the Athenian, the beſt ſea officer of his time, by which means he would obſtruct the paſſage of further recruits from Greece; and thus ſoon put an end to the power of the Lacedæmonians in Aſia. This advice being approved of, the king ordered 500 talents for the equipment of a fleet, with directions to give Conon the command of it.

In the mean time, Dercyllidas, with all his valour and ſkill, ſuffered himſelf to be drawn into ſuch a diſadvantageous ſituation, that he muſt inevitably have been deſtroyed with his whole army, had it not been through the cowardice of Tiſſaphernes, who having experienced the Grecian valour at the battle of Cunaxa, could not by any means be induced to attack them. The Lacedæmonians, however, having heard that the Perſian monarch was fitting out a great fleet againſt them, reſolved to puſh on the war as vigorouſly as poſſible; and for this purpoſe ſent over Ageſilaus one of their kings, and a moſt experienced commander, into Aſia. This expedition was carried on with ſuch ſecrecy, that Ageſilaus arrived at Epheſus before the Perſians had the leaſt notice of his deſigns. Here he took the field with 10,000 foot and 4000 horſe, and falling upon the enemy while they were totally unprepared, carried every thing before him. Tiſſaphernes deceived him into a truce till he had leiſure to aſſemble his forces, but gained little by his treachery; for Ageſilaus deceived him in his turn, and while Tiſſaphernes marched his troops into Caria, the Greeks invaded and plundered Phrygia.

Early in the ſpring, Ageſilaus gave out that his deſign was to invade Lydia; but Tiſſaphernes, who remembered the laſt year's ſtratagem, now taking it for granted that Ageſilaus would really invade Caria, made his troops again march to the defence of that province. But Ageſilaus now led his army into Lydia as he had given out, and approached Sardis; upon which Tiſſaphernes recalled his forces from their former route, with a deſign to relieve the place. But Caria being a very mountainous country, and unfit for horſe, he had marched thither only with the foot, and left the horſe behind on the borders of that province. Whence, on their marching back to the relief of Sardis, the horſe being ſome days march before the foot, Ageſilaus took the advantage of ſo favourable an opportunity, and fell upon them before the foot could come to their aſſiſtance. The Perſians were routed at the very firſt onſet; after which Ageſilaus overran the whole country, enriching both himſelf and his army with the ſpoils of the conquered Perſians.

By this continued ill fortune Artaxerxes was ſo much provoked againſt Tiſſaphernes, that he ſoon after cauſed him to be put to death.

On the death of Tiſſaphernes, Tithrauſtes, who was appointed to ſucceed him, ſent large preſents to Ageſilaus, in hopes of perſuading him to abandon his conqueſts; but finding that commander was not by any means to be induced to relinquiſh the war, he ſent Timocrates of Rhodes into Greece, with large ſums of money to corrupt the leading men in the cities, and rekindle a war againſt the Lacedæmonians. This ſtratagem produced the intended effect; for the cities of Thebes, Argos, Corinth, and others, entering into a confederacy, obliged them to recal Ageſilaus to the defence of his own country. 35 Ageſilaus obliged to leave Aſia.

36 Lacedæmonians defeated. After the departure of Ageſilaus, which happened in the year 354 B. C. the Lacedæmonian power received a ſevere blow at Cnidos, where their fleet was entirely defeated by that of Artaxerxes under Conon, 50 of their ſhips being taken in the engagement; after which, Conon and Pharnabazus being maſters of the ſea, ſailed round the iſlands and coaſts of Aſia, taking the cities there which had been reduced by the Lacedæmonians. Seſtos and Abydos only held out, and reſiſted the utmoſt efforts of the enemy, though they had been beſieged both by ſea and land.

Next year Conon having aſſembled a powerful fleet, again took Pharnabazus on board, and reduced the iſland of Melos, from whence he made a deſcent on the coaſts of Lycaonia, pillaging all the maritime provinces, and loading his fleet with an immenſe booty. After this, Conon obtained leave of him to repair to Athens with 80 ſhips and 50 talents, in order to rebuild the walls of that city; having firſt convinced Pharnabazus,

Persia.

Pharnabazus, that nothing could more effectually contribute to the weakening of the power of Sparta than putting Athens again in a condition to rival its power. He no sooner arrived at Piraeus the port of Athens, but he began to work; which, as he had a great number of hands, and was seconded by the zeal of all those that were well inclined to the Athenians, was soon completed, and the city not only restored to its former splendour,

37 Are obliged to make peace with the Persians.

but rendered more formidable than ever. The Lacedæmonians were now reduced to the necessity of accepting such terms of peace as they could procure. The terms were, that all the Greek cities in Asia should be subject to the king of Persia, as also the islands of Cyprus and Clazomena; that the islands of Scyros, Lemnos, and Imbros, should be restored to the Athenians, and all the cities of Greece, whether small or great, should be declared free; and by the same treaty, Artaxerxes engaged to join those who accepted the terms he proposed, and to assist them to the utmost of his power against such as should reject them.

38 Cyprus reduced.

Artaxerxes, being now disengaged from the Grecian war, turned his arms against Evagoras king of Cyprus. This man was descended from the ancient kings of Salamine the capital city of the island of Cyprus. His ancestors had held that city for many ages in quality of sovereigns; but were at last driven out by the Persians, who, making themselves masters of the whole island, reduced it to a Persian province. Evagoras, however, being a man of an enterprising genius, soon became weary of living in subjection to a foreign power, drove out the Persian governor, and recovered his paternal kingdom. Artaxerxes attempted to drive him out of it; but, being diverted by the Greek war, was obliged to put off the enterprize. However, Conon, by means of Ctesias chief physician to Artaxerxes, got all differences accommodated, and Artaxerxes promised not to molest him in the possession of his small kingdom. But Evagoras soon becoming discontented with such a narrow possession, gradually reduced under his subjection almost the whole of the island. Some, however, there were, who held out against him, and these immediately applied to Artaxerxes for assistance; and he, as soon as the war with Greece was at an end, bent all his force against Evagoras, intending to drive him quite out of the island. The Athenians, however, notwithstanding the favours lately conferred upon them by the king of Persia, could not forbear assisting their old ally in such a dreadful emergency. Accordingly, they sent him ten men of war under the command of Philocrates; but the Lacedæmonian fleet, commanded by Talentias brother to Agesilaus, falling in with them near the isle of Rhodes, surrounded them, so that not one ship could escape. The Athenians, determined to assist Evagoras at all events, sent Chabrias with another fleet and a considerable body of land forces; and with the assistance of these he quickly reduced the whole island. But in a short time, the Athenians being obliged, in consequence of the treaty concluded with the Persians, to recal Chabrias, Artaxerxes attacked the island with an army of 300,000 men, and a fleet of 300 ships. Evagoras applied to the Egyptians, Libyans, Arabians, Tyrians, and other nations, from whom he received supplies both of men and money; and fitted out a fleet, with which he ventured an engagement with that of Artaxerxes. But being defeated, and obliged to shut himself up in Salamine, he was closely besieged by sea and land. Here at last he was obliged to capitulate, and abandon to the Persians the whole of the island except Salamine, which he held as a king tributary to Artaxerxes.

Persia.

The Cyprian war being ended, Artaxerxes turned his arms against the Cadusians, whose country lay between the Euxine and Caspian seas. But these nations were too well accustomed to war to be overcome by the Persians; and therefore the king was obliged to abandon the project, after having lost a great number of his troops and all the horses which he took out with him. In his Egyptian expedition, which happened immediately after the Cadusian war, he was attended with little better success; which, however, was owing to the bad conduct of his general Pharnabazus. This commander being entrusted with the management of the Egyptian war, sent an ambassador to Athens, complaining that Chabrias had engaged in the service of an enemy of the king of Persia, with whom the state of Athens was in alliance, and threatening the republic with his master's resentment if proper satisfaction was not given: at the same time he demanded Iphicrates, another Athenian, and the best general of his time, to command the Greek mercenaries in the Persian service. This the Athenians complied with; and Iphicrates having mustered his troops, so exercised them in all the arts of war, that they became afterwards very famous among the Greeks under the name of *Iphicratesian soldiers.* Indeed he had sufficient time to instruct them; for the Persians were so slow in their preparations, that two whole years elapsed before they were ready to take the field. At the same time Artaxerxes, that he might draw the more mercenaries out of Greece, sent ambassadors to the different states in it, declaring it to be his will and pleasure that they should live at peace with each other, on the terms of the treaty lately concluded: which declaration was received with pleasure by all the states except Thebes, who aspired at the sovereignty of Greece; and accordingly refused to conform to it. All things, however, at last being ready for the expedition, the troops were mustered at the city then called *Ace,* and since *Ptolemais;* where they were found to consist of 200,000 Persians under the command of Pharnabazus, and 20,000 Greeks led by Iphicrates. The fleet consisted of 300 galleys, besides a vast number of other vessels which followed with provisions. The fleet and army began to move at the same time; and that they might act in concert, they separated as little as possible. It was proposed, that the war should begin with the siege of Pelusium; but Nectanebus, the revolted king of Egypt, had provided so well for the defence of the place, that it was thought expedient to drop the enterprize, and make a descent at one of the mouths of the Nile. In this they succeeded: for the Egyptians not expecting them at that place, had not taken such care to fortify it as at Pelusium. The fortress of consequence was easily taken, and all the Egyptians in it put to the sword. After this, Iphicrates was for embarking the troops without loss of time, and attacking Memphis the capital of Egypt. Had this opinion been followed before the Egyptians recovered from the consternation into which they were thrown, it is highly probable that the whole country might have been reduced at once: but Pharnabazus would undertake nothing before the rest of the forces were come up. Iphicrates then, in the

39 Unsuccessful expeditions against the Cadusians and Egyptians.

Perfia.

the utmoft vexation at lofing fo favourable an opportunity, preffed Pharnabazus to allow him to attack the place with the Greek mercenaries only; but he refufed this alfo, from a mean jealoufy of the honour which Iphicrates might acquire; and in the mean time the Egyptians recovered fufficient courage to put themfelves in fuch a pofture of defence, that they could not be attacked with any probability of fuccefs; and at the fame time, the Nile overflowing as ufual, obliged them to return to Phœnice. The expedition was again undertaken 12 years after, but without fuccefs.

40 Ochus fucceeds Artaxerxes.

The laft years of the reign of Artaxerxes were greatly difturbed by diffenfions in his family; which at laft broke his heart, and he died in the 94th year of his age, and 46th of his reign. He was fucceeded by one of his fons named *Ochus*, who behaved with fuch cruelty, that almoft one half of his dominions revolted as foon as he came to the throne. But, by reafon of the diffenfions of the rebels among themfelves, all of them were reduced, one after another; and among the reft, the Sidonians, finding themfelves betrayed, burnt themfelves to the number of 40,000, together with their wives and children.

41 Reduces Egypt.

Ochus, having quelled all the infurgents, immediately fet himfelf about reducing Egypt, and for this purpofe procured a reinforcement of other 10,000 mercenaries from Greece. On his march, he loft a great number of his men drowned in the lake Serbonis, which lies between Phœnice and Egypt, extending about 30 miles in length. When the fouth wind blows, the whole furface of this lake is covered with fand, in fuch a manner that no one can diftinguifh it from the firm land. Several parties of Ochus's army were loft in it for want of proper guides; and it is faid that whole armies have fometimes perifhed in the fame place. When he arrived in Egypt, he detached three bodies to invade the country in different parts; each being commanded by a Perfian and a Greek general. The firft was led by Lachares the Theban, and Rofaces governor of Lydia and Ionia: the fecond by Nicoftratus the Theban and Ariftazanes; the third by Mentor the Rhodian and Bagoas an eunuch. The main body of the army he kept with himfelf, and encamped near Pelufium, with a defign to watch the events of the war there. The event was fuccefsful, as we have related under the article EGYPT; and Ochus having reduced the whole country, difmantled their ftrongholds, plundered the temples, and returned to Babylon loaded with booty.

The king, having ended this war with fuch fuccefs, conferred very high rewards on his mercenaries and others who had diftinguifhed themfelves. To Mentor the Rhodian he gave 100 talents, and other prefents to a great value; appointing him alfo governor of all the coafts of Afia, and committing to his care the whole management of the war which he was ftill carrying on againft fome provinces that had revolted in the beginning of his reign; and all thefe either by ftratagems, or by force, he at laft reduced; reftoring the king's authority in all thefe places.—Ochus then, finding himfelf free from all troubles, gave his attention to nothing but his pleafures, leaving the adminiftration of affairs entirely to Bagoas the eunuch, and to Mentor. Thefe two agreed to fhare the power between them; in confequence of which the former had the provinces of Upper Afia, and the latter all the reft. Bagoas, being by birth an Egyptian, had a great zeal for the religion of his country, and endeavoured, on the conqueft of Egypt, to influence the king in favour of the Egyptian ceremonies; but, in fpite of all his endeavours, Ochus not only refufed to comply, but killed the facred bull, the emblem of the Egyptian god Apis, plundered the temples, and carried away their facred records. This Bagoas fuppofed to be the higheft guilt which a human creature could commit; and therefore poifoned his mafter and benefactor in the 21ft year of his reign. Nor did his revenge ftop here; for he kept the king's body, caufing another to be buried in its ftead; and becaufe the king had caufed his attendants eat the flefh of Apis, Bagoas cut his body in pieces, and gave it fo mangled to be devoured by cats, making handles for fwords of his bones. He then placed Arfes the youngeft of the deceafed king's fons on the throne, that he might the more eafily preferve the whole power to himfelf.

42 Ochus murdered by Bagoas.

Arfes did not long enjoy even the fhadow of power which Bagoas allowed him, being murdered in the fecond year of his reign by that treacherous eunuch, who now conferred the crown on Darius Codomannus, a diftant relation of the royal family. Neither did he incline to let him enjoy the crown much longer than his predeceffor; for, finding that he would not fuffer himfelf to be guided by him in all things, the treacherous Bagoas brought him a poifonous potion; but Darius got rid of him by his own artifice, caufing him to drink the poifon which he brought. This eftablifhed Darius in the throne as far as fecurity from internal enemies could do fo; but in a very little time his dominions were invaded, and, we may fay, the fame moment conquered, by Alexander the Great. The particulars of that hero's conqueft are related under the article MACEDON; we fhall therefore here only take notice of the fate of Darius himfelf, with which the Perfian empire concluded for many ages. After the battle of Arbela, which was decifive in favour of Alexander, the latter took and plundered Perfepolis, from whence he marched into Media, in order to purfue Darius, who had fled to Ecbatan the capital of that province. This unhappy prince had ftill an army of 30,000 foot, among whom were 4000 Greeks, who continued faithful to the laft. Befides thefe, he had 4000 flingers and 3000 horfe, moft of them Bactrians, and commanded by Beffus governor of Bactria. When Darius heard that Alexander was marched to Ecbatan, he retired into Bactria, with a defign to raife another army; but foon after, changing his mind, he determined to venture a battle with the forces he ftill had left. On this Beffus governor of Bactria, and Nabarzanes a Perfian lord of great diftinction, formed a confpiracy againft him, propofing to feize his perfon, and, if Alexander purfued them, to gain his friendfhip and protection by betraying their mafter into his hands; but if they efcaped, their defign was to murder him, and ufurp the crown. The troops were eafily gained over, by reprefenting to them the defperate fituation of Darius's affairs; but Darius himfelf, though informed of their proceedings, and folicited to truft his perfon among the Greeks, refufed to give credit to the report, or follow fuch a falutary counfel. The confequence of this was, that he was in a few days feized by the traitors; who, out of refpect to the royal

43 Darius Codomannus.

44 Perfia conquered by Alexander the Great.

45 Darius feized by his own fubjects.

Persia. royal dignity, bound him with golden chains, and shutting him up in a covered cart, fled with him towards Bactria. The cart was covered with skins, and strangers appointed to drive it without knowing who the prisoner was. Bessus was proclaimed commander in chief in the room of Darius by the Bactrian horse; but Artabazus and his sons, with the forces they commanded, and the Greeks, under the command of one *Patron*, retired from the body of the army under Bessus, and marched over the mountains towards Parthiené. In the mean time Alexander arriving at Ecbatan, was informed that Darius had left the place five days before. He then dispatched orders to Clitus, who had fallen sick at Susa, to repair, as soon as he recovered, to Ecbatan, and from thence to follow him into Parthia with the cavalry and 6000 Macedonians, who were left in Ecbatan. Alexander himself with the rest of the army pursued Darius; and the 11th day arrived at *Rhages*, having marched in that space of time 3300 furlongs. Most of those who accompanied him died through the fatigue of so long a march; insomuch that, on his arrival at Rhages, he could scarcely muster 60 horsemen. Finding that he could not come up with Darius, who had already passed the Caspian straits, he staid five days at Rhages, in order to refresh his army and settle the affairs of Media. From thence he marched into Parthia, and encamped at a small distance from the Caspian straits, which he passed the next day without opposition. He had scarcely entered Parthia, when he was informed that Bessus and Nabarzanes had conspired against Darius, and designed to seize him. Hereupon, leaving the main body of the army behind with Craterus, he advanced with a small troop of horse lightly armed; and having marched day and night without ever halting, except for a few hours, he came on the third day to a village where Bessus with his Bactrians had encamped the day before. Here he understood that Darius had been seized by the traitors; that Bessus had caused him to be shut up in a close cart, which he had sent before, that he might be the more sure of his person; and that the whole army except Artabazus and the Greeks, who had taken another route, obeyed Bessus. Alexander therefore taking with him a small body of light-armed horse, for the others could not possibly proceed further, at last came in sight of the barbarians, who were marching in great confusion. His unexpected appearance struck them, though far superior in number, with such terror, that they immediately betook themselves to flight; and because Darius refused to follow them, Bessus and those

46 who were about him discharged their darts at the un-
and murdered. fortunate prince, leaving him wallowing in his blood. After this they all fled different ways, and were pursued with great slaughter by the Macedonians. In the mean time the horses that drew the cart in which Darius was, stopped of their own accord (for the drivers had been killed by Bessus), near a village about four furlongs from the highway. Thither Polystratus a Macedonian, being pressed with thirst in the pursuit of the enemy, was directed by the inhabitants to a fountain to refresh himself, not far from the place where they stopped. As he was filling his helmet with water, he heard the groans of a dying man; and looking round him, discovered a cart with a team of horses, unable to move by reason of the many wounds they had received. When he drew near, he perceived Darius lying in the cart, and very near his end, having several darts sticking in his body. However, he had strength enough left to call for some water, which Polystratus readily brought him. Darius, after drinking, turned to the Macedonian, and with a faint voice told him, that, in the deplorable state of which he was reduced, it was no small comfort to him that his last words would not be lost: he then charged him to return his hearty thanks to Alexander for the kindness he had shown to his wife and family, and to acquaint him, that, with his last breath, he besought the gods to prosper him in all his undertakings, and make him sole monarch of the universe. He added, that it did not so much concern him as Alexander to pursue and bring to condign punishment those traitors who had treated their lawful sovereign with such cruelty, that being the common cause of all crowned heads. Then, taking Polystratus by the hand, "Give Alexander your hand, says he, as I give you mine, and carry him, in my name, the only pledge I am able to give, in this condition, of my gratitude and affection." Having uttered these words, he expired in the arms of Polystratus. Alexander coming up a few minutes after, bewailed his death, and caused his body to be interred with the high- 47
est honours. The traitor Bessus being at last reduced His murderers pursued.
to extreme difficulties, was delivered up by his own men naked and bound into the hands of the Macedonians; on which Alexander gave him up to Oxathres the brother of Darius, to suffer what punishment he should think proper. Plutarch tells us that he was executed in the following manner: Several trees being by main force bent down to the ground, and one of the traitor's limbs tied to each of them, the trees, as they were suffered to return to their natural position, flew back with such violence, that each carried with it the limb that was tied to it.

48 Revolt of the Parthians.
Thus ended the empire of Persia, 209 years after it had been founded by Cyrus. After the death of Alexander the Persian dominions became subject to Seleucus Nicator, and continued subject to him for 62 years, when the Parthians revolted, and conquered the greatest part of them. To the Parthians they continued subject for 475 years; when the sovereignty was again restored to the Persians, as related under the article PARTHIA.

49 Persian empire again restored by Artaxerxes.
The restorer of the Persian monarchy was Artaxerxes, or Artaxares, who was not only a private person, but of spurious birth. However, he possessed great abilities, by which means he executed his ambitious projects. He was no sooner seated on the throne than he took the pompous title of *king of kings*, and formed a design of restoring the empire to its ancient glory. He therefore gave notice to the Roman governors of the provinces bordering on his dominions, that he had a just right, as the successor of Cyrus, to all the Lesser Asia; which he therefore commanded them immediately to quit, as well as the provinces on the frontiers of the ancient Parthian kingdom, which were already his. The consequence of this was a war with Alexander Severus the Roman emperor. Concerning the event of this war there are very different accounts. It is certain, however, that on account of his exploits against Artaxares, Alexander took the titles of *Parthicus* and *Persicus*; though, it would seem, with no great

great reaſon, as the Perſian monarch loſt none of his dominions, and his ſucceſſors were equally ready with himſelf to invade the Roman territories.

50
Succeeded by Sapor, who takes Valerian the Roman emperor priſoner;

Artaxares dying after a reign of 12 or 15 years, was ſucceeded by his ſon Sapor; a prince of great abilities both of body and mind, but fierce, haughty, untractable, and cruel. He was no ſooner ſeated on the throne than he began a new war with the Romans. In the beginning he was unſucceſsful: being obliged, by the young emperor Gordian, to withdraw from the Roman dominions, and was even invaded in his turn; but, in a ſhort time, Gordian being murdered by Philip, the new emperor made peace with him upon terms very advantageous to the Perſians. He was no ſooner gone than Sapor renewed his incurſions, and made ſuch alarming progreſs, that the emperor Valerian, at the age of 70, marched againſt him in perſon with a numerous army. An engagement enſued, in which the Romans were defeated, and Valerian taken priſoner. Sapor purſued his advantages with ſuch inſolence of cruelty, that the people of the provinces took arms, firſt under Calliſtus a Roman general, and then under Odenatus prince of Palmyrene. Thus they not only protected themſelves from the inſults of the Perſians, but even gained many great victories over them, and drove Sapor with diſgrace into his own dominions. In his march he is ſaid to have made uſe of the bodies of his unfortunate priſoners to fill up the hollow roads, and to facilitate the paſſage of his carriages over ſuch rivers as lay in his way. On his return to Perſia, he was ſolicited by the kings of the Caduſians, Armenians, Bactrians, and other nations, to ſet Valerian at liberty;

51
and treats him cruelly.

but to no purpoſe. On the contrary, he uſed him the worſe; treated him daily with indignities, ſet his foot upon his neck when he mounted his horſe, and, as is affirmed by ſome, flayed him alive after ſome years confinement; and cauſed his ſkin to be tanned, which he kept as a monument of his victory over the Romans. This extreme inſolence and cruelty was followed by an uninterrupted courſe of misfortune. Odenatus defeated him in every engagement, and even ſeemed ready to overthrow his empire; and after him Aurelian took ample vengeance for the captivity of Valerian. Sapor died in the year of Chriſt 273, after having reigned 31 years; and was ſucceeded by his ſon Hormiſdas, and he by Varanes I. Concerning both theſe princes we know nothing more than that the former reigned a year and ten days, and the latter three years; after which he left the crown to Varanes II. who ſeems to have been ſo much awed by the power of the Romans, that he durſt undertake nothing. The reſt of the Perſian hiſtory, to the overthrow of the empire by the Saracens, affords nothing but an account of their continued invaſions of the Roman empire, which more properly belongs to the hiſtory of ROME: and to which therefore we refer.

52
The Perſian empire overthrown by the Saracens.

The laſt of the Perſian monarchs, of the line of Artaxares, was Iſdigertes, or Jezdegerd, as he is called by the Arabian and Perſian hiſtorians, who was cotemporary with Omar the ſecond caliph after Mahomet. He was ſcarcely ſeated on the throne, when he found himſelf attacked by a powerful army of Saracens under the command of one Sad, who invaded the country through Chaldea. The Perſian general took all imaginable pains to haraſs the Arabs on their march; and having an army ſuperior to them in numbers, employed them continually in ſkirmiſhes; which were ſometimes favourable to him and ſometimes otherwiſe. But Sad, perceiving that this lingering war would deſtroy his army, determined to haſten forward, and force the enemy to a general engagement. The Perſians declined this for a long time; but at length, finding a convenient plain where all their forces might act, they drew up in order of battle, and reſolved to wait for the Arabs. Sad having diſpoſed his men in the beſt order he could, attacked the Perſians with the utmoſt fury. The battle laſted three days and three nights; the Perſians retiring continually from one poſt to another, till at laſt they were entirely defeated; and thus the capital city, and the greateſt part of the dominions of Perſia, fell into the hands of the Arabs. The conquerors ſeized the treaſures of the king; which were ſo vaſt, that according to a Mahometan tradition, their prophet gave the Saracen army a miraculous view of thoſe treaſures before the engagement, in order to encourage them to fight.

After the loſs of this battle, Jezdegerd retired into Choraſan, where he maintained himſelf as king, having under his ſubjection two other provinces, named *Kerman* and *Segeſtan*. But after he had reigned in this limited manner for 19 years, one of the governors of the few towns he had left betrayed it, and called in the Turks. This place was called *Merou*, ſeated on the river Gihon or Oxus. Jezdegerd immediately marched againſt the rebels and their allies. The Perſians were defeated; and the unfortunate monarch, having with much difficulty reached the river, found there a little boat, and a fiſherman to whom it belonged. The king offered him a bracelet of precious ſtones; but the fellow, equally brutal and ſtupid, told him that his fare was five farthings, and that he would neither take more nor leſs. While they diſputed, a party of the rebel horſe came up, and knowing Jezdegerd, killed him, in the year 652.

Jezdegerd left behind him a ſon named *Firouz*, and a daughter named *Dara*. The latter eſpouſed Boſtenay, whom the rabbinical writers have dignified with the title of the *head of the captivity*; and who, in fact, was the prince of the Jews ſettled in Chaldea. As for Firouz, he ſtill preſerved a little principality; and when he died, left a daughter named *Mah Afrid*, who married Walid the ſon of the caliph Abdalmalek, by whom ſhe had a ſon named *Yezid*, who became caliph, and conſequently ſovereign of Perſia; and ſo far was this prince from thinking himſelf above claiming the title derived from his mother, that he conſtantly ſtyled himſelf *the ſon of Khoſrou king of Perſia, the deſcendant of the caliph Maroan, and among whoſe anceſtors on the ſide of the mother were the Roman emperor and the khacan.*

53
State of Perſia under the Mogul princes.

Perſia continued to be ſubject to the Arabs till the decline of the Saracen empire, when it was ſeized by various uſurpers, till the time of Jenghis Khan, who conquered it as well as almoſt all the reſt of Aſia. After his death, which happened in the year 1227, Perſia, together with the neighbouring countries, were governed by officers appointed by his ſucceſſors, who reigned at Kærakorom, in the eaſtern parts of Tartary, till the year 1[illegible]3, when it became once more the ſeat of a mighty empire under Hulaku the Mogul, who in 1256 aboliſhed the caliphate, by taking the city of BAGDAD, as related under that article. After the death of Hulaku,

laku, his son Abaka succeeded to his extensive dominions; and his first care was to shut up all the avenues of his empire against the other princes of the race of Jenghiz Khan, who reigned in different parts of Tartary. His precautions, however, were of little avail; for in the very beginning of his reign he was invaded by Barkan Khan, of the race of Jagatay the son of Jenghiz Khan, from Great Bukharia, with an army of 300,000 men. Abaka was but indifferently prepared to oppose such a formidable power; but, happily for him, his antagonist died before the armies came to an engagement, upon which the invaders dispersed and returned to Tartary. In the year 1264, Armenia and Anatolia were ravaged by the Mamlukes from Egypt, but they were obliged to fly from Abaka; who thus seemed to be established in the possession of an empire almost as extensive as that of the ancient Persian kings. His tranquillity, however, was of short duration; for, in 1268, his dominions were invaded by Borak Khan, a prince likewise of the race of Jagatay, with an army of 100,000 men. He quickly reduced the province of Chorasan, where he met with little opposition, and in 1269 advanced as far as Aderbijan, where Abaka had the bulk of his forces. A bloody battle ensued; in which Abaka was victorious, and Borak obliged to fly into Tartary, with the loss of all his baggage and great part of his army. Abaka died in 1282, after a reign of 17 years, not without suspicion of being poisoned; and was succeeded by his brother Ahmed Khan. He was the first of the family of Jenghiz Khan who embraced Mahometanism; but neither he nor his successors appear to have been in the least versed in the arts of government; for the Persian history, from this period, becomes only an account of insurrections, murders, rebellions, and poisonings, till the year 1335, when it split all to pieces, and was possessed by a great number of petty princes; all of whom were at perpetual war with each other till the time of Timur Beg, or Tamerlane, who once more reduced them all under one jurisdiction.

54 Under Tamerlane and his successors.

After the death of Tamerlane, Persia continued to be governed by his son Shah Rukh, a wise and valiant prince; but immediately after his death fell into the same confusion as before; being held by a great number of petty tyrants, till the beginning of the 16th century, when it was conquered by Shah Ismael Safi, or Sefi; of whose family we have the following account. His father was Sheykh Hayder or Haydr, the son of Sultan Juneyd, the son of Sheykh Ibrahim, the son of Sheykh Ali, the son of Sheykh Musa, the son of Sheykh Sefi, who was the 13th in a direct line from Ali the son-in-law of the prophet Mahomet. When Tamerlane returned from the defeat of Bajazet the Turkish sultan, he carried with him a great number of captives out of Caramania and Anatolia, all of whom he intended to put to death on some remarkable occasion; and with this resolution he entered Ardebil, or Ardevil, a city of Aderbijan, about 25 miles to the east of Taurus, where he continued for some days. At this time lived in that city the Sheykh Safi, or Sefi, above mentioned, reputed by the inhabitants to be a saint; and, as said, much reverenced by them. The fame of Safi's sanctity so much moved Tamerlane, that he paid him frequent visits; and, when he was about to depart, promised to grant whatever favour he should ask. Sheykh Safi, who had been informed of Tamerlane's design to put the captives to death, requested of the conqueror that he would spare the lives of those unfortunate men. Tamerlane, desirous of obliging him, not only granted this request, but delivered them up to him to be disposed of as he thought fit; upon which the Sheykh furnished them with clothes and other necessaries as well as he could, and sent them home to their respective countries. This generous action proved very beneficial to the family; for the people were so much affected with such an extraordinary instance of virtue, that they repaired in great numbers to Safi, bringing with them considerable presents; and this so frequently, that few days passed in which he was not visited by many. Thus the descendants of the Sheykh made a conspicuous figure till the year 1486, when they were all destroyed by the Turcomans except Ismael, who fled to Ghilan, where he lived under the protection of the king of that country; after which he became conspicuous on the following occasion.

55 Conquered by Ismael Sefi.

There was at that time, among the Mahometans, a vast number of people dispersed over Asia; and among these a particular party who followed that of Haydr the father of Ismael, which Sheykh Safi, one of his ancestors, had brought into great reputation. Ismael, who had assumed the surname of *Sofi*, or *Sage*, finding that Persia was all in confusion, and hearing that there was a great number of the Hayderian sect in Caramania, removed thither. There he collected 7000 of his party, all devoted to the interest of his family; and while he was yet only 14 years of age, conquered Shirwan. After this he pursued his conquests; and as his antagonists never united to oppose him, had conquered the greatest part of Persia, and reduced the city of Bagdad by the year 1510. However, his conquests on the west side were soon stopped by the Turks; for, in 1511, he received a great defeat from Selim I. who took Tauris; and would probably have crushed the empire of Ismael in its infancy, had he not thought the conquest of Egypt more important than that of Persia. After his defeat by Selim, Ismael never undertook any thing of consequence. He died in 1523, leaving the crown to his eldest son Thamasp I.

The new shah was a man of very limited abilities, and was therefore invaded by the Turks almost instantly on his accession to the throne. However, they were obliged to retreat by an inundation, which overflowed their camp, and which frightened them with its red colour, probably arising from the nature of the soil over which it passed. Thamasp, however, reduced Georgia to a province of the Persian empire; that country being in his time divided among a number of petty princes, who, by reason of their divisions, were able to make little opposition.

56 Reign of Shah Abbas the Great.

The reigns of the succeeding princes afford nothing remarkable till the time of Shah Abbas I. surnamed the *Great*. He ascended the throne in the year 1584; and his first care was to recover from the Turks and Tartars the large provinces they had seized which formerly belonged to the Persian empire. He began with declaring war against the latter, who had seized the finest part of Chorasan. Accordingly, having raised a powerful army, he entered that province, where he was met by Abdallah Khan the chief of the Usbeck Tartars. The two armies lay in sight of each other for six months; but

Persia.

but at length Abbas attacked and defeated his enemies, forcing them, for that time, to abandon Chorasan. Here he continued for three years; and on his leaving that place, fixed the seat of government at Ispahan, where it has continued ever since. His next expedition was against the Turks. Understanding that the garrison of Tauris was in no expectation of an enemy, he formed a design of surprising the place; and having privately assembled a few forces, he marched with such celerity, that he reached a pass called *Shibli* very near Tauris, in six days, though it is usually 18 or 20 days journey for the caravans. Here the Turks had posted a few soldiers, rather for the purpose of collecting the customs on such commodities as were brought that way, than of defending the pass against an enemy. Before they came in sight of this pass, Abbas and some of his officers left the rest of the army, and rode briskly up to the turnpike. Here the secretary of the customhouse, taking them for merchants, demanded the usual duties. Abbas replied, that the person who had the purse was behind, but at the same time ordered some money to be given him. But while the secretary was counting it, he was suddenly stabbed by the Shah's order; and the officers who were with him suddenly falling upon the few soldiers who were there, obliged them to submit; after which he entered the pass with his army. The governor of Tauris marched out with all the troops he could collect on so short a warning; but being inferior to the Persians, he was utterly defeated, and himself taken prisoner; after which the city was obliged to submit, as also a number of places in the neighbourhood. One city only called *Orumi*, being very strongly situated, resisted all the efforts of Abbas; but was at last taken by the assistance of the Curds, whom he gained over by promising to share the plunder of the place with them. But instead of this, he formed a design to cut them all off at once; fearing that they might at another time do the Turks a service of the same nature that they had done to him just now. For this reason he invited their chiefs to dine with him; and having brought them to a tent, the entrance to which had several turnings, he stationed on the inside two executioners, who cut off the heads of the guests as soon as they entered.

After this Shah Abbas considerably enlarged his dominions, and repelled two dangerous invasions of the Turks. He attempted also to promote commerce, and civilize his subjects; but stained all his great actions by his abominable cruelties, which he practised on every one who gave him the least cause of offence; nay frequently without any cause at all. He took the isle of Ormus from the Portuguese, who had kept it since 1507, by the assistance of some English ships in 1622; and died six years after, aged 70.

The princes who succeeded Shah Abbas the Great, were remarkable only for their cruelties and debaucheries, which occasioned a revolution in 1716, when the Shah Hussein was dethroned by the Afghans, a people inhabiting the country between Persia and India; who being oppressed by the ministers, revolted under the

57 History of Khouli Khan.

conduct of one Mereweis. The princes of the Afghan race continued to enjoy the sovereignty for no more than 16 years, when Ashraff the reigning shah was dethroned by one of his officers *. On this Thamasp, otherwise called *Prince Thomas*, the only survivor of the family of Abbas, assembling an army, invited into his service Nadir Khan, who had obtained great reputation for his valour and conduct. He was the son of a Persian nobleman, on the frontiers of Usbeck Tartary; and his uncle, who was his guardian, keeping him out of possession of the castle and estate which was his inheritance, he took to robbing the caravans; and, having increased his followers to upwards of 5000 men, became the terror of that part of the country, and especially of his uncle, who had seized his estate. His uncle therefore resolved to make his peace with him, and with that view invited him to the castle, where he entertained him in a splendid manner; but Nadir Khan ordered his throat to be cut next night, and all his people to be turned out of the castle. No sooner had Nadir Khan got the command of the Persian army, than he attacked and defeated the usurper Esriff, put him to death, and recovered all the places the Turks and Russians had made themselves masters of during the rebellion; and then Prince Thamas seemed to be established on the throne: but Nadir Khan, to whom Thamas had given the name of *Thamas Kouli Khan*, that is, *the Slave of Thamas*, thinking his services not sufficiently rewarded, and pretending that the king had a design against his life, or at least to set him aside, conspired against his sovereign, and put him to death, as is supposed: after which, he usurped the throne, styling himself *Shah Nadir* or *King Nadir*.

He afterwards laid siege to Candahar, of which a son of Mereweis had possessed himself. During this siege, the court of the Great Mogul being distracted with factions, one of the parties invited Shah Nadir to come to their assistance, and betrayed the Mogul into his hands. He thereupon marched to Delhi, the capital of India, and summoned all the viceroys and governors of provinces to attend him, and bring with them all the treasures they could raise; and those that did not bring as much as he expected, he tortured and put to death. Having thus amassed the greatest treasure that ever prince was master of, he returned to Persia, giving the Mogul his liberty, on condition of his resigning the provinces on the west side of the Indus to the crown of Persia. He afterwards made a conquest of Usbeck Tartary, and plundered Bochara the capital city. Then he marched against the Daghestan Tartars; but lost great part of his army in their mountains, without fighting. He defeated the Turks in several engagements; but laying siege to Bagdad, was twice compelled to raise the siege. He proceeded to change the religion of Persia to that of Omar, hanged up the chief priests, put his own son to death, and was guilty of such cruelty, that he was at length assassinated by his own relations, anno 1747. A contest upon this ensued between these relations for the crown, which has rendered Persia a scene of the most horrible confusion for upwards of 40 years.

The reader will form some notion of the troubles of this unhappy country from the following series of pretenders to the throne between the death of Nadir and the accession of Kerim Khan. We give it from Francklin's Observations. 1st, Adil Shah.—2d, Ibraheem Shah.—3d, Shah Rokh Shah.—4th, Suleeman Shah.—5th, Ismaeel Shah.—6th, Azan Khan Afghan.—7th, Hossun Khan Kejar.—8th, Ali Merdan Khan Bukhteari.—9th, Kerim Khan Zund.

58 Different pretenders to the throne of Persia.

"Their

* See Patsani.

Persia.

"Their reigns, or more properly the length of time they respectively governed with their party, were as follows: Adil Shah, nine months. Ibraheem Shah, six months. Shah Rokh Shah, after a variety of revolutions, at length regained the city of Meschid: he is now alive (1787), and above 80 years of age, reigning in Chorasan, under the direction of his son Nussir Ullah Meerza. Suleeman Shah, and Ismaeel Shah, in about forty days were both cut off, almost as soon as they were elevated. Azad Khan Afghan, one of Kerim Khan's most formidable rivals and competitors, was subdued by him, brought prisoner to Shirauz, and died there a natural death. Hossun Khan Kejar, another of Kerim Khan's competitors, was besieging Shirauz, when his army suddenly mutinied and deserted him. The mutiny was attributed to their want of pay. A party sent by Kerim Khan took him prisoner. His head was instantly cut off, and presented to Kerim Khan. His family were brought captives to Shirauz. They were well treated, and had their liberty given them soon after, under an obligation not to quit the city. Ali Merdan Khan was killed by a musket shot as he was walking on the ramparts of Meschid encouraging his men. Kerim Khan Zund, by birth a Curdistan, was a most favourite officer of Nadir Shah, and at the time of his death was in the southern provinces. Shirauz and other places had declared for him. He found means at last, after various encounters with doubtful success, completely to subdue all his rivals, and finally to establish himself as

59 Kerim Khan enjoyed a reign of near 30 years.

ruler of all Persia. He was in power about 30 years; the latter part of which he governed Persia under the appellation of *vakeel* or *regent*, for he never would receive the title of Shah. He made Shirauz the chief city of his residence, in gratitude for the assistance he had received from its inhabitants and those of the southern provinces. He died in the year 1779, regretted by all his subjects, who esteemed and honoured him as the glory of Persia.

60 Twenty-two officers take possession of the citadel.

"When the death of Kerim Khan was announced in the city, much confusion arose; two and twenty of the principal officers of the army, men of high rank and family, took possession of the ark, or citadel, with a resolution to acknowledge Abul Futtah Khan (the eldest son of the late vakeel) as their sovereign, and to defend him against all other pretenders; whereupon Zikea Khan, a relation of the late vakeel by the mother's side,

61 Zikea Khan.

who was possessed of immense wealth, enlisted a great part of the army into his pay, by giving them very considerable bounties. Zikea Khan was of the tribe of Zund (or the Lackeries); a man remarkably proud,

62 Besieges the citadel.

cruel, and unrelenting. Having assembled a large body of troops, he immediately marched them to the citadel, and laid close siege to it for the space of three days; at

63 Employs treacherous means to entice the officers out, and was successful.

the expiration of which, finding he could not take it by force, he had recourse to treachery. To each of the principal khans he sent a written paper, by which he swore upon the Koran, that if they would come out and submit to him, not a hair of their heads should be touched, and that they should have their effects secured to them. Upon this a consultation was held by them; and it appearing that they could not subsist many days longer, they agreed to surrender themselves, firmly relying on the promises that had been made them. Zikea Khan, in the mean time, gave private orders, for the khans to be seized, and brought separately before him as they came out of the citadel. His orders were strictly obeyed, and these deluded men were all massacred in his presence: he was seated the whole time, feasting his eyes on the cruel spectacle.

64 Murdered.

"Zikea Khan's tyranny became soon intolerable, and he was cut off by his own body guard, when Abul Futtah Khan, who was at the time in the camp, was proclaimed king by the unanimous voice of the troops, whom he immediately led back to Shirauz. On his arrival he was acknowledged as sovereign by all ranks of people, and took quiet possession of the government.

65 Mahomed Sadick Khan attempts to seize the government;

"Mahomed Sadick Khan, only brother of the late Kerim Khan, who had during that prince's life filled the high office of beglerbeg of Fars, and had been appointed guardian of his son Abul Futtah Khan, was at this period governor of the city of Bassora, which had been taken by the Persians, previous to the vakeel's death. Upon hearing the news of his brother's decease he became ambitious of reigning alone, and from that instant formed schemes for the destruction of his nephew; but as it was necessary for him to be on the spot for the advancement of his views, he determined to withdraw the Persian garrison from Bassora, who were all devoted to his interest: accordingly he evacuated that place, and marched immediately for Shirauz.

"The news of Sadick Khan's approach threw the inhabitants of Shirauz into the greatest consternation: their minds were variously agitated on the occasion; some, from his known public character, expected he would honestly fulfil the commands of his deceased brother; others, who had been witnesses to the confusion of former times, on similar occasions, rightly imagined that he would set up for himself; and indeed this proved to be the case: for having entered Shirauz a very few days after, he caused Abul Futtah Khan to be seized, deprived of sight, and put into close confinement.

66 which he effects.

"After this event, Sadick Khan openly assumed the government. As soon as the intelligence reached Ali Murad Khan, who was at Ispahan, that lord instantly rebelled: deeming himself to have an equal right to the government with Sadick Khan, as in fact he had, he could ill brook the thought of being obedient to him, and openly declared himself a competitor for the empire. Persia was by this means again involved in all the horrors of a civil war. Ali Murad Khan indeed took possession of Shirauz, assumed the government, and gave to the empire the flattering prospect of being settled under the government of one man; but this prospect was soon obscured by the power and credit acquired by Akau Mahomed Khan."

67 Akau Mahomed Khan collects troops, and is proclaimed at Mazanderan and Ghilan.

On the night following Kerim Khan's death, this man found means to make his escape from Shirauz, and fled to the northward, where collecting some troops, he soon made himself master of Mazanderan and Ghilan, and was proclaimed nearly about the time that Ali Murad Khan had taken Shirauz. "It is remarkable (says our author), that from his first entering into competition for the government, he has been successful in every battle which he has fought. He is an eunuch, having been made so whilst an infant, by the command of Nadir Shah, but possesses great personal bravery."

Ali Murad Khan, hearing of the success of Akau

Perſia.

Mahomed Khan, determined to go againſt him; but as he was previouſly proceeding to Iſpahan to ſuppreſs a rebellion, he fell ſuddenly from his horſe and expired on the ſpot.

68 *Jaafar Khan aſſerts his pretenſions to the government.*

“At this period, Jaafar Khan, the eldeſt and only ſurviving ſon of Sadick Khan, was governor of Khum: he deemed this a favourable opportunity to aſſert his pretenſions to the government, and immediately marched with what few troops he had to Iſpahan: ſoon after his arrival he was joined by the greater part of the malcontents, who were then in arms. In this ſituation he remained ſome time; but Akau Mahomed Khan coming down upon him with his army, he was obliged to riſk his fate in a battle, and, being defeated, fled with the ſmall remains of his troops, taking the road to Shirauz. Soon after finding himſelf ſtrengthened by an increaſe
69 *Is defeated by Akau Mahomed Khan.* of his army, he determined to venture a ſecond engagement with his opponent Akau Mahomed Khan; and for this purpoſe marched with his army towards Iſpahan: the two armies met near Yezdekhaſt, when a battle enſued, and Akau Mahomed Khan's ſuperior fortune again prevailing, Jaafar Khan was defeated, and retired to Shirauz, which he quitted on the 25th of June 1787, and ſhortly after marched his army to the northward, but returned in October without having effected any thing.” Such was the ſtate of Perſia in 1788. Mr Francklin, from whoſe excellent Obſervations on a Tour made in the years 1786-7 theſe particulars are moſtly extracted, ſays that Jaafar Khan is the moſt “likely, in caſe of ſucceſs againſt his opponent, to reſtore the country to a happy and reputable ſtate: but it will require a long ſpace of time to recover it from the calamities into which the different revolutions have brought it:—a country, if an oriental metaphor may be allowed, once blooming as the garden of Eden, fair and flouriſhing to the eye;—now, ſad reverſe! deſpoiled and leafleſs by the cruel ravages of war, and deſolating contention.”

70 *Air and climate of Perſia.*

As to the air and climate of this country, conſidering the great extent thereof, it cannot but be very different, according to the ſituation of its ſeveral parts; ſome being frozen with cold, whilſt others are burnt with heat at the ſame time of the year. The air, wherever it is cold is dry; but where it is extremely hot, it is ſometimes moiſt. All along the coaſt of the Perſian gulf, from weſt to eaſt, to the very mouth of the river Indus, the heat for four months is ſo exceſſive, that even thoſe who are born in the country, unable to bear it, are forced to quit their houſes, and retire to the mountains; ſo that ſuch as travel in theſe parts, at that ſeaſon, find none in the villages, but wretched poor creatures, left there to watch the effects of the rich, at the expence of their own health. The extreme heat of the air, as it is unſupportable, ſo it makes it prodigiouſly unwholeſome; ſtrangers frequently falling ſick there, and ſeldom eſcaping. The eaſtern provinces of Perſia, from the river Indus to the borders of Tartary, are ſubject to great heats, though not quite ſo unwholeſome as on the coaſts of the Indian ocean and the Perſian gulf; but in the northern provinces, on the coaſt of the Caſpian ſea, the heat is full as great, and, though attended with moiſture, as unwholeſome as on the coaſt before mentioned. From October to May, there is no country in the world more pleaſant than this; but the people carry indelible marks of the malign influence of their ſummers, looking all of them of a faint yellow, and having neither ſtrength nor ſpirits; though, about the end of April, they abandon their houſes, and retire to the mountains, which are 25 or 30 leagues from the ſea. But this moiſtneſs in the air is only in theſe parts; the reſt of Perſia enjoys a dry air, the ſky being perfectly ſerene, and hardly ſo much as a cloud ſeen to fly therein. Though it ſeldom rains, it does not follow that the heat admits of no mitigation: for in the night, notwithſtanding there is not a cloud to be ſeen, and the ſky is ſo clear, that the ſtars alone afford a light ſufficient to travel by, a briſk wind ſprings up, which laſts until within an hour of the morning, and gives ſuch a coolneſs to the air, that a man can bear a tolerable warm garment. The ſeaſons in general, and particularly in the middle of this kingdom, happen thus: the winter, beginning in November, and laſting until March, is very ſharp and rude, attended with froſt and ſnow; which laſt deſcends in great flakes on the mountains,
but never in the plains. The climate of Shirauz, the 71 *Climate of Shirauz.*
capital of Perſia Proper, is repreſented by a traveller who lately viſited it, as one of the moſt agreeable in the world, the extremes of heat and cold being ſeldom felt. “During the ſpring of the year the face of the country appears uncommonly beautiful. The flowers, of which they have a great variety, and of the brighteſt hues, the fragrant herbs, ſhrubs, and plants, the roſe, the ſweet baſil, and the myrtle, all here contribute to refreſh and perfume the natural mildneſs of the air. The nightingale of the garden (called by the Perſians *boolbul hezar daſtaan*), the goldfinch, and the linnet, by their melodious warblings at this delightful ſeaſon of the year, ſerve to add to the ſatisfaction of the mind, and to inſpire it with the moſt pleaſing ideas. The beauties of nature are here depicted in their fulleſt extent; the natural hiſtorian and the botaniſt would here meet with ample ſcope for purſuing their favourite inveſtigations. With ſuch advantages, added to the ſalubrity of the air, how can it be wondered at that the inhabitants of Shirauz ſhould ſo confidently aſſert the pre-eminence of their own city to any other in the world?—or that ſuch beauties ſhould fail of calling forth the poetical exertions of a Hafiz, a Sâdi, or a Jâmi? The mornings and evenings are cool, but the middle of the day is very pleaſant. In ſummer the thermometer ſeldom riſes above 73 in the day time, and at night it generally ſinks as low as 62. The autumn is the worſt ſeaſon of the year, that being the time when the rains begin to fall, and during the autumnal months it is conſidered by the natives as the moſt unhealthy; colds, fluxes, and fevers being very general. In winter a vaſt deal of ſnow falls, and very thick, but ice is rarely to be found, except on the ſummits of the mountains, or towards Iſpahan, and the more northern parts of Perſia. One thing which is moſt to be eſteemed in this country, and renders it preferable to any other part of the world, is their nights, which are always clear and bright: and the dew, that in moſt places is of ſo pernicious and dangerous a nature, is not of the leaſt ill conſequence here: there is none at all in ſummer, and in the other ſeaſons it is of ſuch a nature, that if the brighteſt ſcimitar ſhould be expoſed to it all the night, it would not receive the leaſt ruſt; a circumſtance I have myſelf experienced. This dryneſs in the air cauſes their buildings to laſt a great while, and is undoubtedly

Persia. undoubtedly one of the principal reaſons that the celebrated ruins of Perſepolis have endured for ſo many ages, and, comparatively ſpeaking, in ſo perfect a ſtate." The great dryneſs of the air exempts Perſia from thunder and earthquakes. In the ſpring, indeed, there ſometimes falls hail; and, as the harveſt is then pretty far advanced, it does a great deal of miſchief. The rainbow is ſeldom ſeen in this country, becauſe there riſe not vapours ſufficient to form it; but in the night there are ſeen rays of light ſhooting through the firmament, and followed as it were by a train of ſmoke. The winds, however briſk, ſeldom ſwell into ſtorms or tempeſts; but, on the other hand, they are ſometimes poiſonous and infectious on the ſhore of the Gulf, as all travellers agree. M. Tavernier ſays, that at Gombroon people often find themſelves ſtruck by a ſouth wind, in ſuch a manner, that they cry, "I burn!" and immediately fall down dead. M. le Brun tells us, that he was aſſured while he was there, that the weather was ſometimes ſo exceſſively ſultry as to melt the ſeals of letters. At this time the people go in their ſhirts, and are continually ſprinkled with cold water; and ſome even lie ſeveral hours naked in the water. Among the inconveniences conſequent from this malign diſpoſition of the air, one of the moſt terrible is the engendering, in the arms and legs, a kind of long ſmall worms, which cannot be extracted without great danger of breaking them; upon which a mortification enſues.

72 Soil. The ſoil of Perſia is in general ſtony, ſandy, barren, and everywhere ſo dry, that, if it be not watered, it produces nothing, not even graſs; but, where they can turn the water into their plains or valleys, it is not unfruitful. There is a great difference in point of fertility in the different provinces of the empire; and thoſe of Media, Iberia, Hyrcania, and Bactria, are now in a great meaſure what they were formerly, and ſurpaſs moſt of the others in their productions. All along the Perſian gulf, the ſoil is ſtill more barren, cattle leſs plenty, and every thing in a worſe condition than anywhere elſe.

73 Produce. Though there is ſcarcely a province in Perſia which does not produce wine, yet the wine of ſome provinces is much more eſteemed than that of others; but Schiras, or, as it is written by Mr Francklin, *Shiraux*, wine is univerſally allowed to be the very beſt in Perſia; inſomuch, that it is a common proverb there, That to live happily one muſt eat the bread of Yezd, and drink the wine of Schiras.

The grain moſt common in Perſia is wheat; which is wonderfully fair and clean. As for barley, rice, and millet, they only make bread of them in ſome places, as in Courdeſtan, when their wheat bread is exhauſted before the return of harveſt. They do not cultivate in this country either oats or rye; except where the Armenians are ſettled, who make great uſe of the latter in Lent. Rice is the univerſal aliment of all ſorts of people in Perſia; for this reaſon they are extremely careful in its cultivation; for, after they have ſown it in the ſame manner as other grain, they in three months time tranſplant it, root by root, into fields, which are well watered, otherwiſe it would never attain that perfection in which we find it there; ſince it is ſofter, ſooner boiled, and more delicious, than the ſame grain in any other part of the world. Perhaps its taſte is, in ſome meaſure, heightened by a practice which they follow to give it a gloſſy whiteneſs, viz. by cleanſing it, after it is beaten out of the huſks, with a mixture of flour and ſalt. Corn ripens exceedingly in this country; ſo that in ſome parts they have a threefold crop in the year. The Perſian bread is generally very thin, white, and good; and commonly cheap enough.

Metals of all ſorts have been found in Perſia. Since the reign of Shah Abbas the Great, iron, copper, and lead, have been very common; but there are no gold or ſilver mines open at preſent: though, as Perſia is a very mountainous country, ſuch might very probably be found, if pains were taken to ſearch them out. There are ſilver mines in Kerman and Mazanderan, and one not far from Spauhawn; but they cannot be worked for want of wood. Minerals are alſo found in Perſia in abundance; eſpecially ſulphur, ſaltpetre, ſalt, and alum. Nothing is more common in this country than to meet with plains, ſometimes 10 leagues in length, covered entirely with ſalt, and others with ſulphur or alum. In ſome places ſalt is dug out of mines, and even uſed in building houſes. Marble, freeſtone, and ſlate are found in great plenty about Hamadan. The marble is of four colours, viz. white, black, red and black, and white and black. Perſia yields two ſorts of petroleum or naphtha; namely, black and white. In the neighbourhood of Tauris they find azure; but it is not ſo good as that brought from Tartary. Among the moſt valuable productions of Perſia are the precious ſtones called *turquoiſes*, of which there are ſeveral rocks or mines.

The horſes of Perſia are the moſt beautiful of the Eaſt, though they are not ſo much eſteemed as thoſe of Arabia; ſo great, however, is the demand for them, that the fineſt ones will fetch from 90l. to 450l. ſterling. They are higher than the Engliſh ſaddle horſes; ſtraight before, with a ſmall head, legs wonderfully ſlender, and finely proportioned; they are mighty gentle, good travellers, very light and ſprightly, and do good ſervice till they are 18 or 20 years old. The great numbers of them ſold into Turkey and the Indies, though none can be carried out of the kingdom without ſpecial licenſe from the king, is what makes them ſo dear. Next to horſes we may reckon mules, which are much eſteemed here, and are very fine; and next to theſe we may juſtly place aſſes, of which they have in this country two ſorts; the firſt bred in Perſia, heavy and doltiſh, as aſſes in other countries are; the other originally of an Arabian breed, the moſt docile and uſeful creature of its kind in the world. They are uſed wholly for the ſaddle; being remarkable for their eaſy manner of going, and are very ſure-footed, carrying their heads lofty, and moving gracefully. Some of them are valued at 20l. ſterling. The mules here are alſo very fine; they pace well, never fall, and are ſeldom tired. The higheſt price of a mule is about 45l. ſterling. Camels are alſo numerous in Perſia, and very ſerviceable; they call them *lechtiſ-krauch-konion*, i. e. "the ſhips of the land;" becauſe the inland trade is carried on by them as the foreign is by ſhips. Of theſe camels there are two ſorts, the northern and ſouthern: the latter, which is much the ſmaller, but ſwifter, will carry a load of about 700 weight, and trot as faſt as a horſe will gallop; the other will travel with a load of 1200 or 1300 weight; both are profitable to their maſters, as coſting little or nothing to keep. They

Perfia.

travel without halter or reins; grazing on the road from time to time, notwithstanding their load. They are managed entirely by the voice; thofe who direct them making ufe of a kind of fong, and the camel moving brifker, or at its ordinary pace, as they keep a quicker or flower time. The camels fhed their hair fo clean in the fpring, that they look like fcalded fwine: but then they are pitched over, to keep the flies from ftinging them. The camel's hair is the moft profitable fleece of all the tame beafts: fine ftuffs are made of it; and in Europe, hats, with a mixture of a little beaver.

As beef is little eaten in Perfia, their oxen are generally employed in ploughing, and other forts of labour. Hogs are nowhere bred in Perfia, if we except a province or two on the borders of the Cafpian fea. Sheep and deer are very common throughout all Perfia.

Of wild beafts, the number is not great in that country, becaufe there are few forefts; but where there are any, as in Hyrcania, now called *Tabriftan*, abundance of lions, bears, tygers, leopards, porcupines, wild boars, and wolves, are to be found; but the laft are not fo numerous as any of the other fpecies.

There are but few infects in this country; which may be afcribed to the drynefs of the climate. In fome provinces, however, there is an infinite number of locufts or grafhoppers, which fly about in fuch clouds as to darken the air. In certain parts of the Perfian dominions they have large black fcorpions, fo venomous, that fuch as are ftung by them die in a few hours. In others they have lizards frightfully ugly, which are an ell long, and as thick as a large toad, their fkins being as hard and tough as that of the fea-dog; they are faid to attack and kill men fometimes; but that may be doubted. The fouthern provinces are infefted with gnats; fome with long legs, like thofe we call *midges*; and fome white, and as fmall as fleas, which make no buzzing, but fting fuddenly, and fo fmartly, that the fting is like the prick of a needle. Among the reptiles is a long fquare worm, called by the inhabitants *hazar-pey*, i. e. "thoufand feet," becaufe its whole body is covered with feet; it runs prodigioufly faft; and its bite is dangerous, and even mortal if it gets into the ear.

There are in Perfia all the feveral forts of fowls which we have in Europe, but not in fuch great plenty; excepting, however, wild and tame pigeons, of which vaft numbers are kept all over the kingdom, chiefly on account of their dung; which is the beft manure for melons. It is a great diverfion among the lower fort of people in town or country to catch pigeons, though it be forbidden: for this purpofe they have pigeons fo taught, that flying in one flock, they furround fuch wild ones as they find in the field, and bring them back with them to their mafters. The partridges of this country are the largeft and fineft in the world, being generally of the fize of our fowls. Geefe, ducks, cranes, herons, and many other forts of water fowl, are common here; as are likewife nightingales, which are heard all the year, but chiefly in the fpring; martlets, which learn whatever words are taught them; and a bird called *noura*, which chatters inceffantly, and repeats whatever it hears. Of birds of a larger fize, the moft remarkable is the pelican, by the Perfians called *tacab*, i. e. "water-carrier;" and alfo *mifc*, i. e. "fheep," becaufe it is as large as one of thefe animals *. There are in Perfia various birds of prey. Some of their falcons are the largeft and fineft in the world; the people take great pains to teach them to fly at game; the Perfian lords being great lovers of falconry, and the king having generally 800 of this fort of birds, each of which has a perfon to attend it.

* See *Pelicanus*, ORNITHOLOGY *Index*.

74 Mountains, rivers, and feas.

There is perhaps no country in the world which, generally fpeaking, is more mountainous than Perfia; but many of them yield neither fprings nor metals, and but few of them are fhaded with trees. It is true fome of the chief of them are fituated on the frontiers, and ferve as a kind of natural ramparts, or bulwarks, to this vaft empire. Among the latter are the mountains of Caucafus and Ararat, fometimes called the *mountains of Dagheftan*, which fill all the fpace between the Euxine and Cafpian feas: thofe called *Taurus*, and the feveral branches thereof, run through Perfia from Natolia to India, and fill all the middle of the country.

As to rivers, except the Araxes, which rifes in the mountains of Armenia, and falls into the Kur or Cyrus before it reaches the Cafpian fea, there is not one navigable ftream in this country. The Oxus divides Perfia on the north-eaft from Ufbeck Tartary. The Indus alfo may now be reckoned among the rivers of Perfia, as the provinces lying to the weft of that river are now in poffeffion of that crown: this river is faid to run a courfe of more than 1000 miles, and overflows all the low grounds in April, May, and June.

The feas on the fouth of Perfia are, the gulf of Perfia or Baffora, the gulf of Ormus, and the Indian ocean. The only fea on the north is the Cafpian or Hyrcanian fea; which is more properly a lake, having no communication with any other fea. Thefe feas, together with the lakes and rivers, fupply Perfia with plenty of fifh. The Cafpian fea contains very fine fifh on one fide; and the Perfian gulf on the other is believed to have more fifh than any other fea in the world. On the coafts of this gulf is taken a fort of fifh, for which they have no particular name; its flefh is of a red colour, very delicious, and fome of them weigh 200 or 300 pounds. The river fifh are chiefly barbels; but far from being good. Thofe of the lakes are carps and fhads. In the river at Spauhawn are a great number of crabs, which crawl up the trees, and live night and day under the leaves, whence they are taken; and are efteemed very delicious food.

75 Iflands, &c. in the Perfian gulf.

In his voyage from Gombroon up the Perfian gulf, Mr Ives makes mention of feveral iflands, named Kifme, Polloar, Kyes, Inderabie, Shittewar, and Bufheel. Some of thefe were quite barren; on others there were a few trees and bufhes, with little fifhing towns, and a few fmall veffels lying along fhore. The date trees were thinly fcattered among the hills; but though a fmall portion of green might here and there be difcovered, yet fuch was the barrennefs of thefe iflands in general, that it was for fome time a matter of furprife how fheep and goats could poffibly fubfift upon them. On clofer examination, however, it was found, that the foil produced a kind of fmall leaved juicy mallows, on which thefe animals principally feed. The Perfian coaft, as they failed along, afforded a moft romantic profpect, appearing at firft to be one continued rock, rent and torn afunder

aſunder by earthquakes; but it was afterwards diſcovered, that ſome part of it was only ſand hardened by the rains and ſun.

Narban Point terminates in a long and low piece of land, which runs off into the gulf from the foot of the Perſian hills. Between this point and the main land is a channel, in which a ſhip of 900 tons burden might eaſily ride. The Portugueſe had formerly a ſettlement here, the remains of which are ſtill to be ſeen. A large river empties itſelf into the ſea at this place; and Mr Ives obſerves, that "Providence ſeems here to have allotted a ſpot of ground amidſt unhoſpitable rocks and deſerts, capable of affording the kind production of vegetables for man and beaſt." The adjacent country is ſubject to the Arabs.

Through all the Perſian gulf Mr Ives remarks, that the ſpring water on the iſlands is much better than that on the continent; and the water neareſt the ſea on the iſlands has greatly the advantage over that which is found in the middle parts. This holds good, however, only in thoſe parts which are near the ſea; for about 12 miles up the country, both on the Perſian and Arabian ſide of the gulf, the water is very good. At the iſland called Bareen or Baharen, divers go down to the bottom of the ſea, at certain known depths, and come up again with their veſſels filled with freſh water. This freſh water is found in holes or little natural wells, ſome fathoms below the ſurface of the ſea. The Arabs have certain marks on the iſland to teach them where to dive for the freſh water. Mr Ives was aſſured by an Arabian merchant, that he himſelf had diſcovered a ſpring upon the ſhore, by which one of theſe wells is ſerved. He put into this ſpring a bit of heavy ſtick; and in two or three days an Arabian diver brought it to him again from the
76 bottom of one of theſe holes.

Trade. The Engliſh and other nations, trade with the Perſians ſeveral ways, particularly by the gulf of Ormus at Gombroon, and by the way of Turkey. A trade alſo was not many years ſince opened by the Engliſh with Perſia through Ruſſia and the Caſpian ſea; but that is now diſcontinued, having been prohibited by the court of Ruſſia, who were apprehenſive that the Engliſh would teach the Perſians to build ſhips, and diſpute the navigation of the Caſpian ſea with them. The principal commodities and manufactures of Perſia are raw and wrought ſilks, mohair camblets, carpets, leather; for which, and ſome others, the European merchants exchange chiefly woollen manufactures; but the trade is carried on altogether in European ſhipping, the Perſians have ſcarce any ſhips of their own, and the Ruſſians the ſole navigation of the Caſpian ſea. There is not a richer or more profitable trade in the world, than that which is carried on between Gombroon and Surat in the Eaſt Indies; and the Engliſh Eaſt India Company frequently let out their ſhips to tranſport the merchandiſe of the Banians and Armenians from Perſia to India. The ſhah or ſovereign of Perſia, is the chief merchant; and he uſually employs his Armenian ſubjects to traffic for him in every part of the world. The king's agents muſt have the refuſal of all merchandiſe, before his ſubjects are permitted to trade. It is computed that Perſia produces yearly upwards of 22,000 bales of ſilk, chiefly in the provinces of Ghilan and Mazanderan, each bale weighing 263 pounds. Vaſt quantities of Perſian ſilk uſed to be imported into Europe, eſpecially by the Dutch, Engliſh, and Ruſſians, before the civil wars began. The goods exported from Perſia to India are, tobacco, all ſorts of fruits, pickled and preſerved, eſpecially dates, marmalade, wines, diſtilled waters, horſes, Perſian feathers, and Turkey leather of all ſorts and colours, a great quantity whereof is alſo exported to Muſcovy and other European countries. The exports to Turkey are, tobacco, galls, thread, goats hair, ſtuffs, mats, box-work, and many other things. As there are no poſts in the eaſt, and trading by commiſſion with the uſe of bills of exchange, is little known, traffic muſt proceed in a very awkward heavy manner, in compariſon of that Europe. 77

Money. The moſt current money of Perſia are the abaſſees, worth about 1s. 4d. ſterling; they are of the fineſt ſilver. An abaſſee is worth two mahmoudes; a mahmoude, two ſhahees; and a ſhahee, ten ſingle or five double caſbeghes: theſe laſt pieces are of braſs, the others of ſilver; for gold is not current in trade. The ſhahees are not very common; but mahmoudes and caſbeghes are current everywhere. Horſes, camels, houſes, &c. are generally ſold by the toman, which is an imaginary coin, worth 200 ſhahees, or 50 abaſſees; and they uſual reckon their eſtates that way. Such a one, they ſay, is worth ſo many tomans, as we ſay pounds in England. 78

Government. Perſia is an abſolute monarchy, the lives and eſtates of the people being entirely at the diſpoſal of their prince. The king has no council eſtabliſhed, but is adviſed by ſuch miniſters as are moſt in favour; and the reſolutions taken among the women of the haram frequently defeat the beſt laid deſigns. The crown is hereditary, excluding only the females. The ſons of a daughter are allowed to inherit. The laws of Perſia exclude the blind from the throne; which is the reaſon that the reigning prince uſually orders the eyes of all the males of the royal family, of whom he has any jealouſy, to be put out. The king has generally a great many wives, which it would be death for any one beſides the eunuchs, who have the ſuperintendance of them, to look at, or even ſee by accident; wherefore, when he travels, notice is given to all men to quit the road, nay their very houſes, and to retire to a great diſtance.

The prime miniſter is called *attemaet doulet*, which ſignifies the director of the empire, and alſo *vizir azem*, or the great ſupporter of the empire; as he alone almoſt ſuſtains the whole weight of the adminiſtration. This miniſter's chief ſtudy is to pleaſe his maſter, to ſecure to himſelf an aſcendant over his mind, and to avoid whatever may give him any uneaſineſs or umbrage. With this view, he never fails to flatter him, to extol him above all the princes upon earth, and to throw a thick veil over every thing that might help to open his eyes, or diſcover to him the weakneſs of the ſtate. He even takes particular care to keep the king in utter ignorance; to hide from him, or at leaſt to ſoften, all unwelcome news; and, above all, to exalt immoderately every the leaſt advantage he obtains over his enemies. As he takes theſe methods, which indeed are and muſt be taken, more or leſs, by the miniſters of every deſpotic prince, to ſecure the favour and confidence of his maſter; ſo the inferior officers and governors of provinces are obliged to employ all the means in their power to ſecure the prime miniſter's, they depending no leſs upon him than he does upon the king.

There

Persia.

There is a gradation of despotism and slavery, down from the prime minister to the lowest retainer to the court, or dependent on the government. Children are sometimes in Persia required by the king to cut off the ears and nose, and even to cut the throats of their parents; and these orders cannot be objected to, without endangering their own lives. Indeed their baseness and mercenariness are such, that they will perpetrate such atrocious deeds without the least scruple or difficulty, when they have a promise or expectation of possessing their posts. The prime ministers, notwithstanding the precarious footing on which they stand, in effect of their abilities or good fortune, sometimes continue in their employments during life, or, if removed, are only banished to some city, where they are allowed to spend the remainder of their days in a private station.

Next to the prime minister are the nadir, or grand-master of the household; the mehter, or groom of the chambers, who is always a white eunuch; the mirakhor bashe, or master of the horse; the mir-shikar bashe, or great huntsman and falconer; the divanbeggi, or chief justice, to whom there lies an appeal from the deroga, or the lieutenant of police, in every town; the vacka nuviez, or recorder of events, or first secretary of state; the mustau-she-elmenaleek, or master of the accounts and finances of the kingdom; the numes humbashes, or the king's chief physicians; the shickada-sibashe, or inspector of the palace, and regulator of rank at court; and the khans, or governors of provinces, under whom are other governors, called *sultans*, appointed also by the king.

Civil matters are all determined by the cazi, and ecclesiastical ones (particularly divorces) by the sheick-el-selleum, or head of the faith; an officer answering to the mufti among the Turks; under him are the sheick-el-selom, and cadi, who decide in all matters of religion, and make all contracts, testaments, and other public deeds, being appointed by the king in all the principal towns; and next to these are the pichnamas, or directors of the prayers; and the moullahs, or doctors of the law.

Justice is carried on in Persia in a very summary manner; the sentence, whatever it may be, being always put into execution on the spot. Theft is generally punished with the loss of nose and ears; robbing on the road, by ripping up the belly of the criminal, in which situation he is exposed upon a gibbet in one of the most public parts of the city, and there left until he expires in torment.

There is no nobility in Persia, or any respect shown to a man on account of his family, except to those who are of the blood of their great prophet or patriarchs; but every man is esteemed according to the post he possesses; and when he is dismissed, he loses his honour, and he is no longer distinguished from the vulgar.

With respect to the forces of Persia, their two bodies, called the *Kortshies* and *Goulans*, that serve on horseback, are well kept and paid, and may amount, the former to about 22,000, and the latter to about 18,000. The Kortshies are descended from an ancient but foreign race; and the Goulans are either Georgian renegadoes or slaves, or the children of slaves of all nations. The infantry, called *Tangtchies*, are picked out from among the most robust and vigorous of the peasants, and compose a body of 40,000 or 50,000. The Persians have few fortified towns, and had no ships of war, till Kouli Khan built a royal navy, and among them had a man of war of 80 guns; but since the death of that usurper, we hear no more of their fleet.

The arms of the king of Persia are a lion couchant, looking at the sun as he rises over his back. His usual title is *Shaw* or *Patshaw*, the "disposer of kingdoms." They add also to the king's titles those of *sultan*, and *chan* or *cham*, which is the title of the Tartar sovereigns. To acts of state the Persian monarch does not subscribe his name; but the grant runs in this manner, viz. *This act, or edict, is given by him whom the universe obeys.*

79 Manners, &c.

The ancient Persians are known to have been exceedingly voluptuous and effeminate. After the conquest of the empire by Alexander, the Greek discipline and martial spirit being in part communicated to them, they became much more formidable; and hence the Parthians were found to be a match not only for the Syro-Macedonian princes, but even for the Romans. Of their manners we know little or nothing, but that to their valour and military skill they joined in a surprising degree all the luxury and dissipation of the ancient Persians.

The modern Persians, like the Turks, plundering all the adjacent nations for beauties to breed by, are men of a good stature, shape, and complexion; but the Gaures, or ancient Persians, are homely, ill-shaped, and clumsy, with a rough skin, and olive complexions. In some provinces, not only the complexions but the constitutions of the inhabitants, suffer greatly by the extreme heat and unwholesomeness of the air. The Persian women, too, are generally handsome and well-shaped, but much inferior to those of Georgia and Circassia. The men wear large turbans on their heads, some of them very rich, interwoven with gold and silver; a vest, girt with a sash; and over it a loose garment, something shorter; with sandals, or slippers, on their feet. When they ride, which they do every day, if it be but to a house in the same town, they wear pliant boots of yellow leather; the furniture of their horses is extremely rich, and the stirrups generally of silver: whether on horseback or on foot, they wear a broad sword and a dagger in their sash. The dress of the women does not differ much from that of the men; only their vests are longer, and they wear stiffened caps on their heads, and their hair down.

With respect to outward behaviour, says an intelligent traveller, "The Persians are certainly the Parisians of the East. Whilst a rude and insolent demeanor peculiarly marks the character of the Turkish nation towards foreigners and Christians, the behaviour of the Persians would, on the contrary, do honour to the most civilized nations: they are kind, courteous, civil, and obliging, to all strangers, without being guided by those religious prejudices so very prevalent in every other Mahometan nation; they are fond of inquiring after the manners and customs of Europe, and in return very readily afford any information in respect to their own country. The practice of hospitality is with them so grand a point, that a man thinks himself highly honoured if you will enter his house and partake of what the family affords; whereas, going out of a house without smoking a calean, or taking any other refreshment, is deemed in Persia a high affront."

Their

Perſia.

Their uſual drink is water and ſherbet, as in other Mahometan countries, wine being prohibited; but of all Mahometan nations they pay the leaſt regard to this prohibition. Many of them drink wine publicly, and almoſt all of them in private (excepting thoſe who have performed the pilgrimage to Mecca, and eccleſiaſtics): they alſo are very liable to be quarrelſome when inebriated, which is often attended with fatal conſequences. They eat opium, but in much leſs quantities than the Turks; and indeed in every thing they ſay or do, eat or drink, they make a point to be as different from this nation as poſſible, whom they deteſt to a man, beyond meaſure; eſteeming Jews and Chriſtians ſuperior to them, and much nearer to ſalvation.

80 Anecdotes of their religion.

Every one knows, that the religion of the Perſians is Mahometan; and that they are of the ſect of Ali, for whom they entertain the moſt extravagant veneration. Mr Francklin heard one of his guides on the road reprove another for the expreſſion *O God! O Ali!* "No, no (ſaid his zealous companion), *Ali firſt, God ſecond!*" This attachment is the ſource of their hatred to the Turks, and of many ſtrange cuſtoms among themſelves, which we have not room to enumerate; a few, however, muſt be mentioned.

"Their mode of living is as follows: They always riſe at daybreak, in order to perform their devotions. Their firſt prayer is denominated *numaz ſoobh*, or the morning prayer; it is ſaid before ſunriſe, after which they eat a ſlight meal called *nâſhta*, or breakfaſt; this conſiſts of grapes, or any other fruits of the ſeaſon, with a little bread, and cheeſe made of goats milk; they afterwards drink a cup of very ſtrong coffee without milk or ſugar; then the calean or pipe is introduced. The Perſians, from the higheſt to the loweſt ranks, all ſmoke tobacco.

"Their ſecond hour of prayer is called *numaz zòhur*, or mid-day prayer, and is always repeated when the ſun declines from the meridian. Their dinner, or *châſht*, which is ſoon after this prayer, conſiſts of curds, bread, and fruits of various kinds; animal food not being uſual at this meal.

"The third hour of prayer is called *numaz âſur*, or the afternoon prayer, ſaid about four o'clock.

"The fourth hour of prayer is *numaz ſhâm*, or evening prayer, which is ſaid after ſunſet; when this is finiſhed, the Perſians eat their principal meal, called *ſhâmi* or ſupper. This generally conſiſts of a pilau, dreſſed with rich meat ſauces, and highly ſeaſoned with various ſpices: ſometimes they eat *kibaûb* or roaſt meat. When the meal is ready, a ſervant brings notice thereof, and at the ſame time preſents a ewer and water; they then waſh their hands, which is an invariable cuſtom with the Perſians both before and after eating. They eat very quick, conveying their food to their mouths with their fingers; the uſe of knives and forks being unknown in Perſia. Sherbets of different ſorts are introduced, and the meal concludes with a deſert of delicious fruits. The ſupper being finiſhed, the family ſit in a circle, and entertain each other by relating pleaſant ſtories (of which they are exceſſively fond), and alſo by repeating paſſages from the works of their moſt favourite poets, and amuſing themſelves at various kinds of games. The fifth and laſt prayer is ſtyled *numaz akhir*, the laſt prayer; or ſometimes *numaz ſhêb*, or the night prayer, repeated about an hour after ſupper."

Perſia || Perſica.

The moſt remarkable law among the Perſians reſpects marriage. A man may divorce his wife when he chooſes, without aſſigning any other reaſon for the divorce than that it is his pleaſure. If he ſhould change his mind, he may again marry her, divorce her a ſecond time, and a third time marry her; but here this privilege ſtops. No man is allowed to marry the woman whom he has thrice divorced. A widow is obliged to mourn four months for her deceaſed huſband before ſhe can be married to another; but a concubine may form a new connection the inſtant that her keeper expires.

81 Remarkable law reſpecting marriage.

82 Ceremony of naming their children.

At the naming of children in Perſia, Mr Francklin informs us that the following ceremony is obſerved: "The third or fourth day after the child is born, the friends and relations of the woman who has lain in aſſemble at her houſe, attended by muſic and dancing girls hired for the occaſion; after playing and dancing ſome time, a mullah or prieſt is introduced, who, taking the child in his arms, demands of the mother what name ſhe chooſes the infant ſhould be called by; being told, he begins praying, and after a ſhort time applies his mouth cloſe to the child's ear, and tells him diſtinctly three times (calling him by name) to remember and be obedient to his father and mother, to venerate his Koran and his prophet, to abſtain from thoſe things which are unlawful, and to practiſe thoſe things which are good and virtuous. Having repeated the Mahometan profeſſion of faith, he then redelivers the child to his mother; after which the company are entertained with ſweetmeats and other refreſhments, a part of which the females preſent always take care to carry away in their pockets, believing it to be the infallible means of their having offspring themſelves."

83 Intellectual excellence.

The Perſians excel more in poetry than any other ſort of literature; and aſtrologers are now in as great reputation in Perſia as the magi were formerly. Their books are all manuſcripts, the art of printing having not yet been introduced among them: they excel indeed in writing, and have eight different hands. They write from the right hand to the left, as the Arabs do. In their ſhort hand, they uſe the letters of the alphabet; and the ſame letters, differently pointed, will have 20 different ſignifications. In ſhort, the Perſians are born with as good natural parts as any people in the Eaſt, but make a bad uſe of them; being great diſſemblers, cheats, liars, and flatterers, and having a ſtrong propenſity to voluptuouſneſs, luxury, idleneſs, and indolence; vices indeed to which the Aſiatics in general are much addicted.

PERSIAN WHEEL. See HYDRODYNAMICS.

PERSICA, the PEACH, is by Linnæus referred to the ſame claſs and genus with amygdalus. There is a great variety of peach trees planted in the gardens, ſome of which are preſerved only for the beauty of their flowers, but moſt of them for the ſake of the fruit. Of thoſe remarkable for the beauty of their flowers the principal are, 1. The vulgaris, or common peach-tree, with double flowers, which is a very great ornament in gardens, producing very large double flowers of a beautiful red or purple colour, and growing to a conſiderable ſize. 2. The humilis, or dwarf-almond. 3. The africana, or double-flowering dwarf-almond. Theſe two

two reach not above the height of three or four feet, though their flowers are of equal beauty with the former.

Of the peach-trees cultivated for the sake of their fruit there is a great number. They are raised from the stones of the fruit, which should be planted in autumn on a bed of light, dry earth, about three inches deep and four inches asunder. In the winter the beds should be covered with mulch to protect them from the frost. In this bed they should remain for a year; when they are to be taken up and planted in a nursery, where they are to remain one or two years; after which they must be removed to the places where they are to continue.

PERSICARIA. See POLYGONUM, BOTANY *Index*.

PERSICUS SINUS, in *Ancient Geography*, (Mela, Pliny): a part of the sea which the Romans called *Mare Rubrum*, and the Greeks *Mare Erythræum*; washing Arabia Felix on the east, between which and Carmania, entering into the land, it washes Persia on the south. Its large mouth consists of straight sides, like a neck, and then the land retiring equally a vast way, and the sea surrounding it in a large compass of shore, there is exhibited the figure of a human head (Mela). Theophrastus calls this bay *Sinus Arabicus*, a name it equally claims with *Persicus*, only for distinction sake *Persicus* is appropriated to it by others.

PERSIMON. See DIOSPYROS, BOTANY *Index*.—From the persimon is made a very palatable liquor in the following manner: As soon as the fruit is ripe, a sufficient quantity is gathered, which is very easy, as each tree is well stocked with them. These persimon apples are put into a dough of wheat or other flour, formed into cakes, and put into an oven, in which they continue till they are quite baked and sufficiently dry, when they are taken out again: then, in order to brew the liquor, a pot full of water is put on the fire, and some of the cakes are put in: these become soft by degrees as the water grows warm, and crumble in pieces at last; the pot is then taken from the fire, and the water in it well stirred about, that the cakes may mix with it: this is then poured into another vessel, and they continue to steep and break as many cakes as are necessary for a brewing: the malt is then infused, and they proceed as usual with the brewing. Beer thus prepared is reckoned much preferable to other beer. They likewise make brandy of this fruit in the following manner: having collected a sufficient quantity of persimons in autumn, they are altogether put into a vessel, where they lie for a week till they are quite soft: then they pour water on them, and in that state they are left to ferment of themselves, without promoting the fermentation by any addition. The brandy is then made in the common way, and is said to be very good, especially if grapes (in particular of the sweet sort), which are wild in the woods, be mixed with the persimon fruit. Some persimons are ripe at the end of September, but most of them later, and some not before November and December, when the cold first overcomes their acrimony. The wood of this tree is very good for joiners instruments, such as planes, handles to chisels, &c. but if after being cut down it lies exposed to sunshine and rain, it is the first wood which rots, and in a year's time there is nothing left but what is useless. When the persimon trees get once into a field, they are not easily got out of it again, as they spread much.

PERSIS, a Roman lady, whom St Paul salutes in his epistle to the Romans (xvi. 12.), and whom he calls his beloved sister. He says she has laboured much for the Lord, and still labours. Nothing else of her life is come to our knowledge, nor do we know that she is honoured by any church; which is something singular.

PERSIUS FLACCUS, AULUS, a Latin poet in the reign of Nero, celebrated for his satires. He was born, according to some, at Volterra in Tuscany; and according to others, at Tigulia, in the gulf Della Specia, in the year 34. He was educated till 12 years old at Volterra; and afterwards continued his studies at Rome under Palæmon the grammarian, Virginius the rhetorician, and Cornutus the Stoic philosopher, who contracted a friendship for him. Persius consulted that illustrious friend in the composition of his verses. Lucian also studied with him under Cornutus; and appeared so charmed with his verses, that he was incessantly breaking out into acclamations at the beautiful passages in his satires: an example rarely seen in poets of equal rank. He was a steady friend, a good son, an affectionate brother and parent. He was chaste, meek, and modest: which shows how wrong it is to judge of a man's morals by his writings; for the satires of Persius are not only licentious, but sharp and full of bitterness. He wrote but seldom; and it was some time before he applied himself regularly to it.

Persius was of a weak constitution, and troubled with a bad stomach, which was the cause of his death in the 30th year of his age. Six of his satires remain; in their judgments of which the critics have been much divided, excepting as to their obscurity, Persius being indeed the most obscure of all the Latin poets. As a poet, he is certainly inferior to Horace and Juvenal; and all the labours of Isaac Causabon, who has written a most learned and elaborate commentary upon him, cannot make him equal to either of them as a satirist, though in virtue and learning he exceeded them both. He was a professed imitator of Horace; yet had little of Horace's wit, ease, and talent at ridicule. His style is grand, figurative, poetical, and suitable to the dignity of the Stoic philosophy: and hence he shines most in recommending virtue and integrity: here it is that satire becomes him. He was too grave to court the muses with success: but he had a great soul, susceptible of noble sentiments, which give a grace but to indifferent poetry. His cotemporaries thought highly of him. Quintilian allows, that Persius, although he wrote but one book of satires, acquired a great deal of true glory, *Multum et veræ gloriæ quamvis uno libro Persius meruit*: and Martial says much the same thing, *Sæpius in libro memoratur Persius uno*, &c.

PERSON, an individual substance of a rational intelligent nature. Thus we say, an ambassador represents the person of his prince; and that, in law, the father and son are reputed the same person.

The word *person*, *persona*, is thought to be borrowed *à personando*. from personating or counterfeiting; and is supposed to have first signified a mask: because, as Boethius informs us, *in larva concavo sonus volvatur*; and hence the actors who appeared masked on the stage were sometimes called *larvati* and sometimes *personati*. He likewise says, that as the several actors represented each a single individual person, viz. Oedipus, or Chremes, or

Person, Perfonal.

or Hecuba, or Medea; for this reafon, other people, who were at the fame time diftinguifhed by fomething in their form, character, &c. whereby they might be known, came likewife to be called by the Latins *perfonæ*, and by the Greeks *προσωπα*. Again, as actors rarely reprefented any but great and illuftrious characters, the word came at length to import the mind, as being that whofe difpofitions conftitute the character. And thus men, angels, and even God himfelf, were called *perfons*. Things merely corporeal, as a ftone, a plant, or a horfe, were called *hypoftafes* or *fuppofita*, but never *perfons*. Hence the learned fuppofe, that the fame name *perfon* came to be ufed to fignify fome dignity, whereby a *perfon* is diftinguifhed from another; as a father, hufband, judge, magiftrate, &c. In this fenfe we are to underftand that of Cicero: "Cæfar never fpeaks of Pompey, but in terms of honour and refpect: he does many hard and injurious things, however, againft his perfon."

Perfon we have already defined to mean an individual fubftance of a reafonable nature. Now a thing may be individual two ways: 1. Logically, becaufe it cannot be predicated of any other; as Cicero, Plato, &c. 2. Phyfically; in which fenfe a drop of water, feparated from the ocean, may be called an individual. Perfon is an individual nature in each of thefe fenfes; logically, according to Boethius, becaufe *perfon* is not fpoken of univerfals, but only of fingulars and individuals; we do not fay the *perfon* of an animal or a man, but of Cicero and Plato: and phyfically, fince Socrates's hand or foot are never confidered as perfons. This laft kind of individual is denominated two ways: pofitively, when the perfon is faid to be the whole principle of acting; for to whatever thing action is attributed, that the philofophers call a *perfon*: and negatively, as when we fay, with the Thomifts, &c. that a perfon confifts in this, that it does not exift in another as a more perfect being. Thus a man, though he confifts of two different things, viz. body and fpirit, is not two perfons; becaufe neither part of itfelf is a complete principle of action, but one perfon, fince the manner of his confifting of body and fpirit is fuch as conftitutes one whole principle of action; nor does he exift in any other as a more perfect being; as, for example, Socrates's foot does in Socrates, or a drop of water in the ocean.

PERSON, in *Grammar*, a term applied to fuch nouns or pronouns as, being either prefixed or underftood, are the nominatives in all inflections of a verb; or it is the agent or patient in all finite or perfonal verbs. See GRAMMAR.

PERSONAL, any thing that concerns, or is reftrained to, the perfon: thus it is a maxim in ethics, that all faults are perfonal.

PERSONAL Action, in *Law*, is an action levied directly and folely againft the perfon, in oppofition to a real or mixed action. See ACTION.

PERSONAL Goods, or *Chattels*, in *Law*, fignifies any moveable thing belonging to a perfon, whether alive or dead. See CHATTELS.

PERSONAL Identity. See METAPHYSICS, Part III. Chap. iii.

PERSONAL Verb, in *Grammar*, a verb conjugated in all the three perfons; thus called in oppofition to an imperfonal verb, or that which has the third perfon only.

Perfonality ‖ Perfonifying.

PERSONALITY, in the fchools, is that which conftitutes an individual a diftinct perfon.

PERSONATÆ, is the name of the 40th order in Linnæus's Fragments of a Natural Method, confifting of a number of plants whofe flowers are furnifhed with an irregular gaping or grinning petal, which in figure fomewhat refembles the fnout of an animal. The bulk of the genera of this natural order arrange themfelves under the clafs and order didynamia angiofpermia of the Sexual Method.

The reft, although they cannot enter into the artificial clafs juft mentioned, for want of the claffic character, the inequality of the ftamina; yet, in a natural method, which admits of greater latitude, may be arranged with thofe plants which they refemble in their habit and general appearance, and particularly in the circumftances expreffed in that title.

PERSONIFYING, or PERSONALIZING, the giving an inanimate being the figure, fentiments, and language of a perfon.

Dr Blair, in his Lectures on Rhetoric, gives this account of perfonification. "It is a figure, the ufe of which is very extenfive, and its foundation laid deep in human nature. At firft view, and when confidered abftractly, it would appear to be a figure of the utmoft boldnefs, and to border on the extravagant and ridiculous. For what can feem more remote from the track of reafonable thought, than to fpeak of ftones and trees, and fields and rivers, as if they were living creatures, and to attribute to them thought and fenfation, affections and actions? One might imagine this to be no more than childifh conceit, which no perfon of tafte could relifh. In fact, however, the cafe is very different. No fuch ridiculous effect is produced by perfonification when properly employed; on the contrary, it is found to be natural and agreeable, nor is any very uncommon degree of paffion required in order to make us relifh it. All poetry, even in its moft gentle and humble forms, abounds with it. From profe it is far from being excluded; nay, in common converfation, very frequent approaches are made to it. When we fay, the ground *thirfts* for rain, or the earth *fmiles* with plenty; when we fpeak of ambition's being *reftlefs*, or a difeafe being *deceitful*; fuch expreffions fhow the facility with which the mind can accommodate the properties of living creatures to things that are inanimate, or to abftract conceptions of its own forming.

Indeed, it is very remarkable, that there is a wonderful pronenefs in human nature to animate all objects. Whether this arifes from a fort of affimilating principle, from a propenfion to fpread a refemblance of ourfelves over all other things, or from whatever other caufe it arifes, fo it is, that almoft every emotion which in the leaft agitates the mind beftows upon its object a momentary idea of life. Let a man, by an unwary ftep, fprain his ankle, or hurt his foot upon a ftone, and in the ruffled difcompofed moment he will fometimes feel himfelf difpofed to break the ftone in pieces, or to utter paffionate expreffions againft it, as if it had done him an injury. If one has been long accuftomed to a certain fet of objects, which have made a ftrong impreffion on his imagination; as to a houfe, where he has paffed many agreeable years; or to fields, and trees, and mountains, among which he has often walked with the greateft delight; when he is obliged to part with them, efpe-

cially

Perfonify-ing.

cially if he has no profpect of ever feeing them again, he can fcarce avoid having fomewhat of the fame feeling as when he is leaving old friends. They feem endowed with life. They became objects of his affection; and, in the moment of his parting, it fcarce feems abfurd to him to give vent to his feeling in words, and to take a formal adieu.

"So ftrong is that impreffion of life which is made upon us, by the more magnificent and ftriking objects of nature efpecially, that I doubt not in the leaft of this having been one caufe of the multiplication of divinities in the heathen world. The belief of dryads and naiads, of the genius of the wood and the god of the river, among men of lively imaginations, in the early ages of the world, eafily arofe from this turn of mind. When their favourite rural objects had often been animated in their fancy, it was an eafy tranfition to attribute to them fome real divinity, fome unfeen power or genius which inhabited them, or in fome peculiar manner belonged to them. Imagination was highly gratified, by thus gaining fomewhat to reft upon with more ftability; and when belief coincided fo much with imagination, very flight caufes would be fufficient to eftablifh it.

"From this deduction may be eafily feen how it comes to pafs that perfonification makes fo great a figure in all compofitions where imagination or paffion have any concern. On innumerable occafions it is the very language of imagination and paffion; and therefore deferves to be attended to, and examined with peculiar care. There are three different degrees of this figure, which it is neceffary to remark and diftinguifh, in order to determine the propriety of its ufe. The firft is, when fome of the properties or qualities of living creatures are afcribed to inanimate objects; the fecond, when thofe inanimate objects are introduced as acting like fuch as have life; and the third, when they are reprefented either as fpeaking to us, or as liftening to what we fay to them."

The ingenious profeffor goes on to inveftigate the nature of perfonification at confiderable length. We fhall give his caution for the ufe of it in profe compofitions, in which he informs us this figure requires to be ufed with great moderation and delicacy. "The fame liberty is not allowed to the imagination there as in poetry. The fame affiftances cannot be obtained for raifing paffion to its proper height by the force of numbers and the glow of ftyle. However, addreffes to inanimate objects are not excluded from profe; but have their place only in the higher fpecies of oratory. A public fpeaker may on fome occafions very properly addrefs religion or virtue; or his native country, or fome city or province, which has fuffered perhaps great calamities, or been the fcene of fome memorable action. But we muft remember, that as fuch addreffes are among the higheft efforts of eloquence, they fhould never be attempted unlefs by perfons of more than ordinary genius: for if the orator fails in his defign of moving our paffions by them, he is fure of being laughed at. Of all frigid things, the moft frigid are the awkward and unfeafonable attempts fometimes made towards fuch kinds of perfonification, efpecially if they be long continued. We fee the writer or fpeaker toiling and labouring to exprefs the language of fome paffion which he neither feels himfelf nor can make us feel. We remain not only cold but frozen; and are at full leifure to criticife on the ridiculous figure which the perfonified object makes, when we ought to have been tranfported with a glow of enthufiafm. Some of the French writers, particularly Boffuet and Flechier, in their fermons and funeral orations, have attempted and executed this figure, not without warmth and dignity. Their works are exceedingly worthy of being confulted for inftances of this and of feveral other ornaments of ftyle. Indeed the vivacity and ardour of the French genius is more fuited to this bold fpecies of oratory, than the more correct but lefs animated genius of the Britifh, who in their profe works very rarely attempt any of the high figures of eloquence."

PERSPECTIVE.

PERSPECTIVE is the art of drawing on a plane furface true refemblances or pictures of objects, as the objects themfelves appear to the eye from any diftance and fituation, real or imaginary.

It was in the 16th century that *Perfpective* was revived, or rather reinvented. It owes its birth to painting, and particularly to that branch of it which was employed in the decorations of the theatre, where landfcapes were properly introduced, and which would have looked unnatural and horrid if the fize of the objects had not been pretty nearly proportioned to their diftance from the eye. We learn from Vitruvius, that Agatharchus, inftructed by Æfchylus, was the firft who wrote upon this fubject; and that afterwards the principles of the art were more diftinctly taught by Democritus and Anaxagoras, the difciples of Agatharchus. Of the theory of this art, as defcribed by them, we know nothing; fince none of their writings have efcaped the general wreck that was made of ancient literature in the dark ages of Europe. However, the revival of painting in Italy was accompanied with a revival of this art.

The firft perfon who attempted to lay down the rules of perfpective was Pietro del Borgo, an Italian. He fuppofed objects to be placed beyond a tranfparent tablet, and endeavoured to trace the images which rays of light, emitted from them, would make upon it. But we do not know what fuccefs he had in this attempt, becaufe the book which he wrote upon the fubject is not now extant. It is, however, very much commended by the famous Egnazio Dante; and, upon the principles of Borgo, Albert Durer conftructed a machine, by which he could trace the perfpective appearance of objects.

Balthazar Peruffi ftudied the writings of Borgo, and endeavoured to make them more intelligible. To him we owe the difcovery of points of diftance, to which all lines that make an angle of 45 degrees with the ground-line are drawn. A little time after, Guido Ubalni, another Italian, found that all the lines that are

parallel

parallel to one another, if they be inclined to the ground-line, converge to some point in the horizontal line; and that through this point also, a line drawn from the eye, parallel to them, will pass. These principles put together enabled him to make out a pretty complete theory of perspective.

Great improvements were made in the rules of perspective by subsequent geometricians; particularly by Professor Gravesende, and still more by Dr Brooke Taylor, whose principles are in a great measure new, and far more general than any before him.

In order to understand the principles of perspective, it will be proper to consider the plane on which the representation is to be made as transparent, and interposed between the eye of the spectator and the object to be represented. Thus, suppose a person at a window looks through an upright pane of glass at any object beyond it, and, keeping his head steady, draws the figure of the object upon the glass with a black lead pencil, as if the point of the pencil touched the object itself; he would then have a true representation of the object in perspective as it appears to his eye.

In order to this two things are necessary: first, that the glass be laid over with strong gum-water, which, when dry, will be fit for drawing upon, and will retain the traces of the pencil: and, secondly, that he looks through a small hole in a thin plate of metal, fixed about a foot from the glass, between it and his eye, and that he keeps his eye close to the hole; otherwise he might shift the position of his head, and consequently make a false delineation of the object.

Having traced out the figure of the object, he may go over it again with pen and ink; and when that is dry, put a sheet of paper upon it, and trace it thereon with a pencil: then taking away the paper and laying it on a table, he may finish the picture by giving it the colours, lights, and shades, as he sees them in the object itself; and then he will have a true resemblance of the object.

To every person who has a general knowledge of the principles of optics, this must be self-evident: For as vision is occasioned by pencils of rays coming in straight lines to the eye from every point of the visible object, it is plain that, by joining the points in the transparent plane, through which all those pencils respectively pass, an exact representation must be formed of the object, as it appears to the eye in that particular position, and at that determined distance; and were pictures of things to be always first drawn on transparent planes, this simple operation, with the principle on which it is founded, would comprise the whole theory and practice of perspective. As this, however, is far from being the case, rules must be deduced from the sciences of optics and geometry for drawing representations of visible objects on opaque planes; and the application of these rules constitutes what is properly called the *art* of perspective.

Previous to our laying down the fundamental principles of this art, it may not be improper to observe, that when a person stands right against the middle of one end of a long avenue or walk, which is straight and equally broad throughout, the sides thereof seem to approach nearer and nearer to each other as they are further and further from his eye; or the angles, under which their different parts are seen, become less and less according as the distance from his eye increases; and if the avenue be very long, the sides of it at the farthest end will seem to meet: and there an object that would cover the whole breadth of the avenue, and be of a height equal to that breadth, would appear only to be a mere point.

Having made these preliminary observations, we now proceed to the practice of perspective, which is built upon the following

(*Fundamental*) THEOREM I.

Let *a b c d* (fig. 1.) represent the ground-plan of the figure to be thrown into perspective, and *e f g h* the transparent plane through which it is viewed by the eye at E. Let these planes intersect in the straight line KL. Let B be any point in the ground-plan, and BE a straight line, the path of a ray of light from that point to the eye. This will pass through the plane *e f g h* in some point *b*; or B will be seen through that point, and *b* will be the picture, image, or representation of B. Plate CCCCX. fig. 1.

If BA be drawn in the ground-plan, making any angle BAK with the common intersection, and EV be drawn parallel to it, meeting the picture-plane or perspective-plane in V, and VA be drawn, the point *b* is in the line VA so situated that BA is to EV as *b*A to *b*V.

For since EV and BA are parallel, the figure BA*b*VE*b*B is in one plane, cutting the perspective-plane in the straight line VA; the triangles BA*b*, EV*b*, are similar, and BA : EV = *b*A : *b*V.

Cor. 1. If B be beyond the picture, its picture *b* is above the intersection KL; but if B be between the eye and the picture, as at B′, its picture *b*′ is below KL.

2. If two other parallel lines BA′, ES, be drawn, and A′, S, be joined, the picture of B is in the intersection of the lines AV and A′S.

3. The line BA is represented by *b*A, or *b*A is the picture of BA; and if AB be infinitely extended, it will be represented by AV. V is therefore called the *vanishing point* of the line AB.

4. All lines parallel to AB are represented by lines converging to V from the points where these lines intersect the perspective-plane; and therefore V is the vanishing point of all such parallel lines.

5. The pictures of all lines parallel to the perspective-plane are parallel to the lines themselves. Fig. 2.

6. If through V be drawn HVO parallel to KL, the angle EVH is equal to BAK. Fig. 1.

Remark. The proposition now demonstrated is not limited to any inclination of the picture-plane to the ground-plane; but it is usual to consider them as perpendicular to each other, and the ground-plane as horizontal. Hence the line KL is called the *ground-line*, and OH the *horizon-line*; and OK, perpendicular to both, is called the *height of the eye*.

If ES be drawn perpendicular to the picture-plane, it will cut it in a point S of the horizon-line directly opposite to the eye. This is called the *point of sight*, or *principal point*.

7. The

7. The pictures of all vertical lines are vertical, and the pictures of horizontal lines are horizontal, because these lines are parallel to the perspective plane.

8. The point of sight S is the vanishing point of all lines perpendicular to the perspective plane.

The above proposition is a sufficient foundation for the whole practice of perspective, whether on direct or inclined pictures, and serves to suggest all the various practical constructions, each of which has advantages which suit particular purposes. Writers on the subject have either confined themselves to one construction, from an affectation of simplicity or fondness for system; or have multiplied precepts, by giving every construction for every example, in order to make a great book, and give the subject an appearance of importance and difficulty. An ingenious practitioner will avoid both extremes, and avail himself of the advantage of each construction as it happens to suit his purpose. We shall now proceed to the practical rules, which require no consideration of intersecting planes, and are all performed on the perspective plane by means of certain substitutions for the place of the eye and the original figure. The general substitution is as follows:

Let the plane of the paper be first supposed to be the ground-plan, and the spectator to stand at F Fig. 3. (fig. 3.). Let it be proposed that the ground-plan is to be represented on a plane surface, standing perpendicularly on the line GKL of the plan, and that the point K is immediately opposite to the spectator, or that FK is perpendicular to GL: then FK is equal to the distance of the spectator's eye from the picture.

Now suppose a piece of paper laid on the plan with its straight edge lying on the line GL; draw on this paper KS perpendicular to GL, and make it equal to the height of the eye above the ground-plan. This may be much greater than the height of a man, because the spectator may be standing on a place much raised above the ground-plan. Observe also that KS must be measured on the same scale on which the ground-plan and the distance FK were measured. Then draw HSO parallel to GL. This will be a horizontal line, and (when the picture is set upright on GL) will be on a level with the spectator's eye, and the point S will be directly opposite to his eye. It is therefore called the *principal point*, or *point of sight*. The distance of his eye from this point will be equal to FK. Therefore make SP (in the line SK) equal to FK, and P is the projecting point or substitute for the place of the eye. It is sometimes convenient to place P above S, sometimes to one side of it on the horizontal line, and in various other situations; and writers, ignorant of, or inattentive to, the principles of the theory, have given it different denominations, such as *point of distance*, *point of view*, &c. It is merely a substitute for the point E in fig. 1. and its most natural situation is below, as in this figure.

The art of perspective is conveniently divided into Ichnography, which teaches how to make a perspective draught of figures on a plane, commonly called the ground-plan; and Scenography, which teaches how to draw solid figures, or such figures as are raised above this plan.

Fundamental Prob. I. *To put into perspective any given point of the ground-plan.*

First general construction.

From B and P (fig. 3.) draw any two parallel lines Fig. 3. BA, PV, cutting the ground-line and horizon-line in A and V, and draw BP, AV, cutting each other in *b*; *b* is the picture of B.

For it is evident that BA, PV, of this figure are analogous to BA and EV of fig. 1. and that BA : PV = *b* A : *b* V.

If BA′ be drawn perpendicular to GL, PV will fall on PS, and need not be drawn. A′V will be A′S.—This is the most easy construction, and nearly the same with Ferguson's.

Second general construction.

Draw two lines BA, BA″, and two lines PV, PD, parallel to them, and draw AV, A″D, cutting each other in *b*. *b* is the picture of B by Cor. 2.—This construction is the foundation of all the rules of perspective that are to be found in the books on this subject. They appear in a variety of forms, owing to the ignorance or inattention of the authors to the principles. The rule most generally adhered to is as follows:

Draw BA (fig. 4.) perpendicular to the ground Fig. 4. line, and AS to the point of sight, and set off A β equal to BA. Set off SD equal to the distance of the eye in the opposite direction from S that β is from A, where B and E of fig. 1. are on opposite sides of the picture; otherwise set them the same way. D is called the point of distance. Draw β D, cutting AS in *b*. This is evidently equivalent to drawing BA′ and PS perpendicular to the ground-line and horizon-line, and BA″ and PD (fig. 3.) making an angle of 45° with these lines, with the additional puzzle about the way of setting off A′A″ and SD, which is avoided in the construction here given. Fig. 3.

This usual construction, however, by a perpendicular and the point of distance, is extremely simple and convenient; and two points of distance, one on each side of S, serve for all points of the ground plan. But the first general construction requires still fewer lines, if BA be drawn perpendicular to GL, because PV will then coincide with PS.

Third general construction.

Draw BA (fig. 4.) from the given point B perpendicular to the ground-line, and AS to the point of sight. Fig. 4. From the point of distance D set off D *d* equal to BA, on the same or the contrary sides as S, according as B is on the same or the contrary side of the picture as the eye. Join *d*, A, and draw D *b* parallel to *d* A. *b* is the picture of B. For SD, D *d*, are equal to the distances of the eye and given point from the picture, and SD : D *d* = *b* S : *b* A.

This construction does not naturally arise from the original lines, but is a geometrical consequence from their position and magnitude; and it is of all others the most generally convenient, as the perpendicular distances of any number of points may be arranged along SD without confusion, and their direct situations transferred to the ground-line by perpendiculars such as BA; and nothing

nothing is easier than drawing parallels, either by a parallel ruler or a bevel square, used by all who practise drawing.

Fig. 5. PROB. 2. *To put any straight line* BC (fig. 5.) *of the ground plan in perspective.*

Find the pictures *b*, *c*, of its extreme points by any of the foregoing constructions, and join them by the straight line *b c*.

Perhaps the following construction will be found very generally convenient.

Produce CB till it meet the ground-line in A, and draw PV parallel to it; join AV, and draw PB, PC, cutting AV in *b*, *c*. V is its vanishing point, by Cor. 3. of the fundamental theorem.

It must be left to the experience and sagacity of the drawer to select such circumstances as are most suitable to the multiplicity of the figures to be drawn.

PROB. 3. *To put any rectilineal figure of the ground-plan in perspective.*

Put the bounding lines in perspective, and the problem is solved.

The variety of constructions of this problem is very great, and it would fill a volume to give them all. The most generally convenient is to find the vanishing points of the bounding lines, and connect these with the points of their intersection with the ground line.

Fig. 6. For example, to put the square ABCD (fig. 6.) into perspective.

Draw from the projecting point PV, PW, parallel to AB, BC, and let AB, BC, CD, DA, meet the ground-line, in α, $\varkappa$, δ, β, and draw α V, δ V, $\varkappa$ W, β W, cutting each other in *a b c d*, the picture of the square ABCD. The demonstration is evident.

This construction, however, runs the figure to great distances on each side of the middle line, when any of the lines of the original figure are nearly parallel to the ground-line.

Fig. 7. The following construction (fig. 7.) avoids this inconvenience.

Let D be the point of distance. Draw the perpendiculars A α, B β, C $\varkappa$, D δ, and the lines A *e*, B *f*, C *g*, D *h*, parallel to PD. Draw S α, S β, S $\varkappa$, S δ, and D *e*, D *f*, D *g*, D *h*, cutting the former in *a*, *b*, *c*, *d*, the angles of the picture.

It is not necessary that D be the point of distance, only the lines A *e*, B *f*, &c. must be parallel to PD.

Remark. In all the foregoing constructions the necessary lines (and even the finished picture) are frequently confounded with the original figure. To avoid this great inconvenience, the writers on perspective direct us to transpose the figure; that is, to transfer it to the other side of the ground-line, by producing the perpendiculars A α, B β, C $\varkappa$, D δ, till α A′, β B′, &c. are respectively equal to A α, B β, &c.; or, instead of the original figure, to use only its transposed substitute A′B′C′D′. This is an extremely proper method. But in this case the point P must also be transposed to P′ above S, in order to retain the first or most natural and simple con-

Fig. 8. struction, as in fig. 8; where it is evident, that when BA=AB′, and SP=SP′, and B′P′ is drawn, cutting AS in *b*, we have *b* A : *b* S=B′A : P′S,=BA : PS, and *b* is the picture of B: whence follows the truth of all the subsequent constructions with the transposed figure.

PROB. 4. *To put any curvilineal figure on the ground-plan into perspective.*

Put a sufficient number of its points in perspective by the foregoing rules, and draw a curve line through them.

It is well known that the conic sections and some other curves, when viewed obliquely, are conic sections or curves of the same kind with the originals, with different positions and proportions of their principal lines, and rules may be given for describing their pictures founded on this property. But these rules are very various, unconnected with the general theory of perspective, and more tedious in the execution, without being more accurate than the general rule now given. It would be a useless affectation to insert them in this elementary treatise.

We come in the next place to the delineation of figures not in a horizontal plane, and of solid figures. For this purpose it is necessary to demonstrate the following

THEOREM II.

The length of any vertical line standing on the ground plane is to that of its picture, as the height of the eye to the distance of the horizon line from the picture of its foot.

Let BC (fig. 2.) be the vertical line standing on B, Fig. 2.
and let EF be a vertical line through the eye. Make BD equal to EF, and draw DE, CE, BE. It is evident that DE will cut the horizon line in some point *d*, CE will cut the picture plane in *c*, and BE will cut it in *b*, and that *b c* will be the picture of BC, and is vertical, and that BC is to *b c* as BD to *b d*, or as EF to *b d*.

Cor. The picture of a vertical line is divided in the same ratio as the line itself. For BC : BM= *b c* : *b m*.

PROB. 5. *To put a vertical line of a given length in perspective standing on a given point of the picture.*

Through the given point *b* (fig. 9.) of the picture, Fig. 9.
draw S *b* A from the point of sight, and draw the vertical line AD, and make AE equal to the length or height of the given line. Join ES, and draw *b c* parallel to AD, producing *b c*, when necessary, till it cut the horizontal line in *d*, and we have *b c* : *b d*,= AE : AD, that is, as the length of the given line to the height of the eye, and *b d* is the distance of the horizon-line from the point *b*, which is the picture of the foot of the line. Therefore (Theor. 2.) *b c* is the required picture of the vertical line.

This problem occurs frequently in views of architecture; and a compendious method of solving it would be peculiarly convenient. For this purpose, draw a vertical line XZ at the margin of the picture, or on a separate paper, and through any point V of the horizon-line draw VX. Set off XY, the height of the vertical-line, and draw VY. Then from any points *b*, *r*, on which it is required to have the pictures of lines equal to XY, draw *b*′*s*, *r t*, parallel to the horizon-line, and draw the verticals

verticals $s\,u$, $t\,v$: these have the lengths required, which may be transferred to *b* and *r*. This, with the third general construction for the base points, will save all the confusion of lines which would arise from constructing each line apart.

PROB. 6. *To put any sloping line in perspective.*

From the extremities of this line, suppose perpendiculars meeting the ground plane in two points, which we shall call the base points of the sloping line. Put these base points in perspective, and draw, by last problem, the perpendiculars from the extremities. Join these by a straight line. It will be the picture required.

PROB. 7. *To put a square in perspective, as seen by a person not standing right against the middle of either of its sides, but rather nearly even with one of its corners.*

Fig. 10. In fig. 10. let ABCD be a true square, viewed by an observer, not standing at *o*, directly against the middle of its sides AD, but at O almost even with its corner D, and viewing the side AD under the angle AOD; the angle A *o* D (under which he would have seen AD from *o*) being 60 degrees.

Fig. 11. Make AD in fig. 11. equal to AD in fig. 10. and draw SP and O *o* parallel to AD. Then, in fig. 11. let O be the place of the observer's eye, and SO be perpendicular to SP; then S shall be the point of sight in the horizon SP.

Take SO in your compasses, and set that extent from S to P; then P shall be the true point of distance, taken according to the foregoing rules.

From A and D draw the straight lines AS and DS; draw also the straight line AP, intersecting DS in C.

Lastly, through the point of intersection C draw BC parallel to AD; and ABCD in fig. 11. will be a true perspective representation of the square ABCD in fig. 10. The point M is the centre of each square, and AMC and BMD are the diagonals.

PROB. 8. *To put a reticulated square in perspective, as seen by a person standing opposite to the middle of one of its sides.*

Fig. 12. A reticulated square is one that is divided into several little squares, like net-work, as fig. 12. each side of which is divided into four equal parts, and the whole surface into four times four (or 16) equal squares.

Having divided this square into the given number of lesser squares, draw the two diagonals A *x* C and B *x* D.

Fig. 13. Make AD in fig. 13. equal to AD in fig. 12. and divide it into four equal parts, as A *e*, *e g*, *g i*, and *i* D.

Draw SP for the horizon, parallel to AD, and, through the middle point *g* of AD, draw OS perpendicular to AD and SP.—Make S the point of sight, and O the place of the observer's eye.

Take SP equal to SO, and P shall be the true point of distance.—Draw AS and DS to the point of sight, and AP to the point of distance, intersecting DS in C: then draw BC parallel to AD, and the outlines of the reticulated square ABCD will be finished.

From the division points *e*, *g*, *i*, draw the straight lines *e f*, *g h*, *i k*, tending towards the point of sight S; and draw BD for one of the diagonals of the square, the other diagonal AC being already drawn.

Through the points *r* and *s*, where these diagonals cut *e f* and *i k*, draw *l m* parallel to AD. Through the centre-point *x*, where the diagonals cut *g h*, draw *n o* parallel to AD.—Lastly, through the points *v* and *w*, where the diagonals cut *e f* and *i k*, draw *p q* parallel to AD; and the reticulated perspective square will be finished.

This square is truly represented, as if seen by an observer standing at O, and having his eye above the horizontal plane ABCD on which it is drawn; as if OS was the height of his eye above that plane: and the lines which form the small squares within it have the same letters of reference with those in fig. 12. which is drawn as it would appear to an eye placed perpendicularly above its centre *x*.

PROB. 9. *To put a circle in perspective.*

If a circle be viewed by an eye placed directly over its centre, it appears perfectly round, but if it be obliquely viewed, it appears of an elliptical shape. This is plain by looking at a common wine-glass set upright on a table.

Make a true reticulated square, as fig. 12. of the same diameter as you would have the circle; and setting one foot of your compasses in the centre *x*, describe as large a circle as the sides of the square will contain. Then, having put this reticulated square into perspective, as in fig. 13. observe through what points of the cross lines and diagonals of fig. 12. the circle passes; and through the like points in fig. 13. draw the ellipsis, which will be as true a perspective representation of the circle, as the square in fig. 13. is of the square in fig. 12. Fig. 12.

This is Mr Ferguson's rule for putting a circle in perspective; but the following rules by Wolf are perhaps more universal.

If the circle to be put in perspective be small, describe a square about it. Draw first the diagonals of the square, and then the diameters *h a* and *d e* (fig. 14.) cutting one another at right angles; draw the straight lines *f g* and *b c* parallel to the diameter *d e*. Through *b* and *f*, and likewise *c* and *g*, draw straight lines meeting DE, the ground line of the picture in the points 3 and 4. To the principal point V draw the straight lines 1 V, 3 V, 4 V, 2 V, and to the points of distance L and K, 2 L and 1 K. Lastly, join the points of intersection, *a*, *b*, *d*, *f*, *h*, *g*, *e*, *c*, by the arcs *a b*, *b d*, *d f*, and *a b d f h g e c a* will be the circle in perspective. Fig. 14.

If the circle be large so as to make the foregoing practice inconvenient, bisect the ground line AB, describing, from the point of bisection as a centre, the semicircle AGB (fig. 15.), and from any number of points in the circumference C, F, G, H, I, &c. draw to the ground line the perpendiculars C 1, F 2, G 3, H 4, I 5, &c. From the points A, 1, 2, 3, 4, 5, B, draw straight lines to the principal point or point of sight V, likewise straight lines from B and A to the points of distance L and K. Through the common intersections draw straight lines as in the preceding case; and you will have the points *a*, *c*, *f*, *g*, *h*, *i*, *b*, representatives of A, C, F, G, H, I, B. Then join the points *a*, *c*, *f*, &c. as formerly directed, and you have the perspective circle *a c f g h i b i h g f c a*. Fig. 15.

Hence

Hence it is apparent how we may put not only a circle but alſo a pavement laid with ſtones of any form in perſpective. It is likewiſe apparent how uſeful the ſquare is in perſpective; for, as in the ſecond caſe, a true ſquare was deſcribed round the circle to be put in perſpective, and divided into ſeveral ſmaller ſquares, ſo in this third caſe we make uſe of the ſemicircle only for the ſake of brevity inſtead of that ſquare and circle.

PROB. 10. *To put a reticulated ſquare in perſpective, as ſeen by a perſon not ſtanding right againſt the middle of either of its ſides, but rather nearly even with one of its corners.*

Fig. 16. In fig. 16. let O be the place of an obſerver, viewing the ſquare ABCD almoſt even with its corner D.—Draw at pleaſure SP for the horizon, parallel to AD, and make SO perpendicular to SP: then S ſhall be the point of ſight, and P the true point of diſtance, if SP be made equal to SO.

Draw AS and DS to the point of ſight, and AP to the point of diſtance, interſecting DS in the point C; then draw BC parallel to AD, and the outlines of the perſpective ſquare will be finiſhed. This done, draw the lines which form the leſſer ſquares, as taught in Prob. 8. and the work will be completed.—You may put a perſpective circle in this ſquare by the ſame rule as it was done in fig. 13.

PROB. 14. *To put a cube in perſpective, as if viewed by a perſon ſtanding almoſt even with one of its edges; and ſeeing three of its ſides.*

Fig. 17. In fig. 17. let AB be the breadth of either of the ſix equal ſquare ſides of the cube AG; O the place of the obſerver, almoſt even with the edge CD of the cube, S the point of ſight, SP the horizon parallel to AD, and P the point of diſtance taken as before.

Make ABCD a true ſquare; draw BS and CS to the point of ſight, and BP to the point of diſtance, interſecting CS in G.—Then draw FG parallel to BC, and the uppermoſt perſpective ſquare ſide BFGC of the cube will be finiſhed.

Draw DS to the point of ſight, and AP to the point of diſtance, interſecting DS in the point I: then draw GI parallel to CD; and, if the cube be an opaque one, as of wood or metal, all the outlines of it will be finiſhed; and then it may be ſhaded as in the figure.

But if you want a perſpective view of a tranſparent glaſs cube, all the ſides of which will be ſeen, draw AH toward the point of ſight, FH parallel to BA, and HI parallel to AD: then AHID will be the ſquare baſe of the cube, perſpectively parallel to the top BFGC; ABFH will be the ſquare ſide of the cube, parallel to CGID, and FGIH will be the ſquare ſide parallel to ABCD.

As to the ſhading part of the work, it is ſuch mere children's play, in compariſon of drawing the lines which form the ſhape of any object, that no rules need be given for it. Let a perſon ſit with his left ſide toward a window, and he knows full well, that if any ſolid body be placed on a table before him, the light will fall on the left-hand ſide of the body, and the right-hand ſide will be in the ſhade.

2

PROB. 15. *To put any ſolid in perſpective.*

Put the baſe of the ſolid, whatever it be, in perſpective by the preceding rules. From each bounding point of the baſe, raiſe lines repreſenting in perſpective the altitude of the object; by joining theſe lines and ſhading the figure according to the directions in the preceding problem, you will have a ſcenographic repreſentation of the object. This rule is general; but as its application to particular caſes may not be apparent, it will be proper to give the following example of it.

PROB. 16. *To put a cube in perſpective as ſeen from one of its angles.*

Since the baſe of a cube ſtanding on a geometrical plane, and ſeen from one of its angles, is a ſquare ſeen from one of its angles, draw firſt ſuch a perſpective ſquare: then raiſe from any point of the ground-line DE (fig. 18.) the perpendicular HI equal to the ſide of the ſquare, and draw to any point V in the horizontal line HR the ſtraight lines VI and VH. From the angles *d*, *b*, and *c*, draw the dotted lines *d* 2 and *c* 1 parallel to the ground line DE. Perpendicular to thoſe dotted lines, and from the points 1 and 2, draw the ſtraight lines L 1 and M 2. Laſtly, ſince HI is the altitude of the intended cube in *a*, L 1 in *c* and *b*, M 2 in *d*, draw from the point *a* the ſtraight line *fa* perpendicular to *a* E, and from the points *b* and *c*, *bg* and *ce*, perpendicular to *bc* 1, and *abdc* being according to rule, make *af*=HI, *bg*=*ec*=L 1, and *hd*=M 2. Then, if the points *g*, *h*, *e*, *f*, be joined, the whole cube will be in perſpective. Fig. 18.

PROB. 17. *To put a ſquare pyramid in perſpective, as ſtanding upright on its baſe, and viewed obliquely.*

In fig. 19. let AD be the breadth of either of the four ſides of the pyramid ATCD at its baſe ABCD; and MT its perpendicular height. Let O be the place of the obſerver, S his point of ſight, SE his horizon, parallel to AD and perpendicular to OS; and let the proper point of diſtance be taken in SE produced toward the left hand, as far from S as O is from S. Fig. 19.

Draw AS and DS to the point of ſight, and DL to the point of diſtance, interſecting AS in the point B. Then, from B, draw BC parallel to AD; and ABCD ſhall be the perſpective ſquare baſe of the pyramid.

Draw the diagonal AC, interſecting the other diagonal BD at M, and this point of interſection ſhall be the centre of the ſquare baſe.

Draw MT perpendicular to AD, and of a length equal to the intended height of the pyramid: then draw the ſtraight outlines AT, CT, and DT; and the outlines of the pyramid (as viewed from O) will be finiſhed; which being done, the whole may be ſo ſhaded as to give it the appearance of a ſolid body.

If the obſerver had ſtood at *o*, he could have only ſeen the ſide ATD of the pyramid; and two is the greateſt number of ſides that he could ſee from any other place of the ground. But if he were at any height above the pyramid, and had his eye directly over its top, it would then appear as in fig. 20. and he would ſee all its four ſides E, F, G, H, with its top *t*, juſt over the centre of its ſquare baſe ABCD; which Fig. 20.

would

would be a true geometrical and not a perſpective ſquare.

PROB. 18. *To put two equal ſquares in perſpective, one of which ſhall be directly over the other, at any given diſtance from it, and both of them parallel to the plane of the horizon.*

Fig. 21. In fig. 21. let ABCD be a perſpective ſquare on a horizontal plane, drawn according to the foregoing rules, S being the point of ſight, SP the horizon (parallel to AD), and P the point of diſtance.

Suppoſe AD, the breadth of this ſquare to be three feet; and that it is required to place juſt ſuch another ſquare EFGH directly above it, parallel to it and two feet from it.

Make AE and DH perpendicular to AD, and two thirds of its length: draw EH, which will be equal and parallel to AD; then draw ES and HS to the point of ſight S, and EP to the point of diſtance P, interſecting HS in the point G: this done, draw FG parallel to EH; and you will have two perſpective ſquares ABCD and EFGH, equal and parallel to one another, the latter directly above the former, and two feet diſtant from it; as was required.

By this method ſhelves may be drawn parallel to one another, at any diſtance from each other in proportion to their length.

PROB. 19. *To put a truncated pyramid in perſpective.*

Let the pyramid to be put in perſpective be quinquangular. If from each angle of the ſurface whence the top is cut off, a perpendicular be ſuppoſed to fall upon the baſe, theſe perpendiculars will mark the bounding points of a pentagon, of which the ſides will be parallel to the ſides of the baſe of the pyramid, within which it is inſcribed. Join theſe points, and the interior pentagon will be formed with its longeſt ſide parallel to the longeſt ſide of the baſe of the pyramid.

Fig. 22. From the ground line EH (fig. 22.) raiſe the perpendicular IH, and make it equal to the altitude of the intended pyramid. To any point V draw the ſtraight lines IV and HV, and by a proceſs ſimilar to that in Prob. 16. determine the ſcenographical altitudes *a*, *b*, *c*, *d*, *e*. Connect the upper points *f*, *g*, *h*, *i*, *k*, by ſtraight lines; and draw *lk*, *fm*, *gn*, and the perſpective of the truncated pyramid will be completed.

Cor. If in a geometrical plane two concentric circles be deſcribed, a truncated cone may be put in perſpective in the ſame manner as a truncated pyramid.

PROB. 20. *To put in perſpective a hollow priſm lying on one of its ſides.*

Fig. 23. Let ABDEC (fig. 23.) be a ſection of ſuch a priſm. Draw HI parallel to AB, and diſtant from it the breadth of the ſide on which the priſm reſts; and from each angle internal and external of the priſm let fall perpendiculars to HI. The parallelogram will be thus divided by the ichnographical proceſs below the ground-line, ſo as that the ſide AB of the real priſm will be parallel to the correſponding ſide of the ſcenographic view of it.—To determine the altitude of the internal

Fig. 24. and external angles. From H (fig. 24.) raiſe HI perpendicular to the ground-line, and on it mark off the true altitudes H 1, H 2, H 3, H 4, and H 5. Then if from any point V in the horizon be drawn the ſtraight lines VH, V 1, V 2, V 3, V 4, V 5 or VI; by a proceſs ſimilar to that of the preceding problem, will be determined the height of the internal angles, viz. 1 = *a a*, 2 = *b b*, 4 = *d d*; and of the external angles, 3 = *c c*, and 5 = *e e*; and when theſe angles are formed and put in their proper places, the ſcenograph of the priſm is complete.

PROB. 21. *To put a ſquare table in perſpective, ſtanding on four upright ſquare legs of any given length with reſpect to the breadth of the table.*

In fig. 21. let ABCD be the ſquare part of the floor on which the table is to ſtand, and EFGH the ſurface of the ſquare table, parallel to the floor. Fig. 21.

Suppoſe the table to be three feet in breadth, and its height from the floor to be two feet; then two thirds of AD or EH will be the length of the legs *i* and *k*; the other two (*l* and *m*) being of the ſame length in perſpective.

Having drawn the two equal and parallel ſquares ABCD and EFGH, as ſhown in Prob. 18. let the legs be ſquare in form, and fixed into the table at a diſtance from its edges equal to their thickneſs. Take A *a* and D *d* equal to the intended thickneſs of the legs, and *a b* and *d c* alſo equal thereto. Draw the diagonals AC and BD, and draw ſtraight lines from the points *a*, *b*, *c*, *d*, towards the point of ſight S, and terminating at the ſide BC. Then, through the points where theſe lines cut the diagonals, draw the ſtraight lines *n* and *o*, *p* and *q*, parallel to AD; and you will have formed four perſpective ſquares (like ABCD in fig. 19.) for Fig. 19. the baſes of the four legs of the table: and then it is eaſy to draw the four upright legs by parallel lines, all perpendicular to AD; and to ſhade them as in the figure.

To repreſent the intended thickneſs of the table-board, draw *e h* parallel to EH, and HG toward the point of ſight S: then ſhade the ſpaces between theſe lines, and the perſpective figure of the table will be finiſhed.

PROB. 22. *To put five ſquare pyramids in perſpective, ſtanding upright on a ſquare pavement compoſed of the ſurfaces of* 81 *cubes.*

In fig. 25. let ABCD be a perſpective ſquare drawn Fig. 25. according to the foregoing rules; S the point of ſight, P the point of diſtance in the horizon PS, and AC and BD the two diagonals of the ſquare.

Divide the ſide AD into 9 equal parts (becauſe 9 times 9 is 81) as A *a*, *a b*, *b c*, &c. and from theſe points of diviſion, *a*, *b*, *c*, *d*, &c. draw lines toward the point of ſight S, terminating at the furthermoſt ſide BC of the ſquare. Then, through the points where theſe lines cut the diagonals, draw ſtraight lines parallel to AD, and the perſpective ſquare ABCD will be ſubdivided into 81 leſſer ſquares, repreſenting the upper ſurfaces of 81 cubes, laid cloſe to one another's ſides in a ſquare form.

Draw AK and DL, each equal to A *a*, and perpendicular to AD; and draw LN toward the point of ſight S:, then draw KL parallel to AD, and its diſtance from AD will be equal to A *a*.—This done, draw *a l*, *b m*, *c n*, *d o*, *e p*, *f q*, *g r*, and *h s*, all parallel to AK; and the ſpace ADLK will be ſubdivided

into

into nine equal ſquares, which are the outer upright ſurfaces of the nine cubes in the ſide AD of the ſquare ABCD.

From the points where the lines, which are parallel to AD in this ſquare, meet the ſide CD thereof, draw ſhort lines to LN, all parallel to DL, and they will divide that ſide into the outer upright ſurfaces of the nine cubes which compoſe it: and then the outſides of all the cubes that can be viſible to an obſerver, placed at a proper diſtance from the corner D of the ſquare, will be finiſhed.

As taught in Prob. 17. place the pyramid AE upright on its ſquare baſe A *t v a*, making it as high as you pleaſe; and the pyramid DH on its ſquare baſe *h u w* D, of equal height with AE.

Draw EH from the top of one of theſe pyramids to the top of the other; and EH will be parallel to AD.

Draw ES and HS to the point of ſight S, and HP to the point of diſtance P, interſecting ES in F.

From the point F, draw FG parallel to EH; then draw EG, and you will have a perſpective ſquare EFGH (parallel to ABCD) with its two diagonals EG and FH, interſecting one another in the centre of the ſquare at I. The four corners of this ſquare, E, F, G, H, give the perſpective heights of the four pyramids AE, BF, CG, and DH; and the interſection I of the diagonals gives the height of the pyramid MI, the centre of whoſe baſe is the centre of the perſpective ſquare ABCD.

Laſtly, place the three pyramids BF, CG, MI, upright on their reſpective baſes at B, C, and M; and the required perſpective repreſentation will be finiſhed as in the figure.

Prob. 23. *To put upright pyramids in perſpective, on the ſides of an oblong ſquare or parallelogram; ſo that their diſtances from one another ſhall be equal to the breadth of the parallelogram.*

Fig. 26. In moſt of the foregoing operations we have conſidered the obſerver to be ſo placed, as to have an oblique view of the perſpective objects: in this, we ſhall ſuppoſe him to have a direct view of fig. 26. that is, ſtanding right againſt the middle of the end AD which is neareſt to his eye, and viewing AD under an angle of 60 degrees.

Having cut AD in the middle, by the perpendicular line S *s*, take S therein at pleaſure for the point of ſight, and draw ES for the horizon, parallel to AD.—Here S *s* muſt be ſuppoſed to be produced downward, below the limits of the plate, to the place of the obſerver; and SE to be produced towards the left hand beyond E, far enough to take a proper point of diſtance therein, according to the foregoing rules.

Take A *d* at pleaſure, and D *g* equal to A *d*, for the breadths of the ſquare baſes of the two pyramids AE and DF next the eye: then draw AS and *d* S, and likewiſe DS and *g* S, to the point of ſight S; and DG on to the point of diſtance, interſecting AS in G: then, from G draw GI parallel to AD, you will have the firſt perſpective ſquare AGID of the parallelogram ABCD.

From I draw IH to (or toward) the point of diſtance, interſecting AS in H: then, from H draw HK parallel to AD, and you will have the ſecond perſpective ſquare GHKI of the parallelogram.—Go on in this manner till you have drawn as many perſpective ſquares up toward S as you pleaſe.

Through the point *e*, where DG interſect *g* S, draw *bf* parallel to AD; and you will have formed the two perſpective ſquare baſes A *b c d* and *e f* D *g* of the two pyramids at A and D.

From the point *f* (the upper outward corner of *e f* D *g*) draw *f h* toward the point of diſtance, till it meets AS in *h*; then, from this point of meeting, draw *h m* parallel to GI, and you will have formed the two perſpective ſquares G *h i k* and *l m* I *n*, for the ſquare baſes of the two pyramids at G and I.

Proceed in the ſame manner to find the baſes of all the other pyramids, at the corners of the reſt of the perſpective ſquares in the parallelogram ABCD, as ſhown by the figure.—Then,

Having placed the firſt two pyramids at A and D upright on their ſquare baſes, as ſhown in Prob. 9. and made them of any equal heights at pleaſure, draw ES and FS from the tops of theſe pyramids to the point of ſight S: place all the reſt of the pyramids upright on their reſpective baſes, making their tops touch the ſtraight lines ES and FS; and all the work, except the ſhading part, will be finiſhed.

Prob. 24. *To put a ſquare pyramid of equal fixed cubes in perſpective.*

Fig. 27. repreſents a pyramid of this kind; conſiſting as it were of ſquare tables of cubes, one table above another; 81 in the loweſt, 49 in the next, 25 in the third, 9 in the fourth, and 1 in the fifth or uppermoſt. Theſe are the ſquare numbers of 9, 7, 5, 3, and 1. Fig. 27.

If the artiſt is already maſter of all the preceding operations, he will find leſs difficulty in this than in attending to the following deſcription of it: for it cannot be deſcribed in a few words, but may be executed in a very ſhort time.

In fig. 28. having drawn PS for the horizon, and taken S for the point of ſight therein (the obſerver being at O) draw AD parallel to PS for the ſide (next the eye) of the firſt or lowermoſt table of cubes. Draw AS and DS to the point of ſight S, and DP to the point of diſtance P, interſecting AS in the point B. Then, from B, draw BC parallel to AD, and you will have the ſurface ABCD of the firſt table. Fig. 28.

Divide AD into nine equal parts, as A *a*, *a b*, *b c*, *c d*, &c. then make AK and DL equal to A *a*, and perpendicular to AD. Draw KL parallel to AD, and from the points of equal diviſion at *a*, *b*, *c*, &c. draw lines to KL, all parallel to AK. Then draw *h* S to the point of ſight S, and from the diviſion points *a*, *b*, *c*, &c. draw lines with a black lead pencil, all tending towards the point of ſight, till they meet the diagonal BD of the ſquare.

From theſe points of meeting draw black lead lines to DC, all parallel to AD; then draw the parts of theſe lines with black ink which are marked 1, 2, 3, 4, &c. between *h* E and DC.

Having drawn the firſt of theſe lines *a q* with black ink, draw the parts *a i*, *b k*, *c l*, &c. (of the former lines which met the diagonal BD) with black ink alſo; and rub out the reſt of the black lead lines, which would

would otherwise confuse the following part of the work. Then, draw LF toward the point of sight S; and, from the points where the lines 1, 2, 3, 4, &c. meet the line DC, draw lines down to LF, all parallel to DL; and all the visible lines between the cubes in the first table will be finished.

Make *i* G equal and perpendicular to *β i*, and *q* M equal and parallel to *i* G; then draw GM, which will be equal and parallel to *i q*. From the points *k*, *l*, *m*, *n*, &c. draw *k n*, *l o*, *m p*, &c. all parallel to *i* G, and the outsides of the seven cubes in the side G *q* of the second table will be finished.

Draw GS and MS to the point of sight S, and MP to the point of distance P, intersecting GS in H; then, from the point of intersection H, draw HI parallel to AD; and you will have the surface GHIM of the second table of cubes.

From the points *n*, *o*, *p*, *q*, &c. draw black lead lines toward the point of sight S, till they meet the diagonal MH of the perspective square surface GHIM; and draw SM, with black ink, toward the point of sight.

From those points where the lines drawn from *n*, *o*, *p*, *q*, &c. meet the diagonal MH, draw black lead lines to MI, all parallel to AD; only draw the whole first line *γ* 1 with black ink, and the parts 2, 3, 4, &c. and *n t*, *o u*, *p v*, &c. of the other lines between *y* N and MI, and GM and *γ* 1, with the same; and rub out all the rest of the black lead lines, to avoid further confusion. Then, from the points where the short lines 1, 2, 3, &c. meet the line MI, draw lines down to *q* E, all parallel to M *q*, and the outer surfaces of the seven cubes in the side ME will be finished; and all these last lines will meet the former parallels 2, 3, 4, &c. in the line *q* E.

Make *t* O equal and perpendicular to *γ t*, and *y* P equal and parallel to *t* O; then draw OP, which will be equal and parallel to *t y*.—This done, draw OS and PS to the point of sight S, and PP to the point of distance P in the horizon. Lastly, from the point Q, where PP intersects OS, draw QR parallel to OP; and you will have the outlines OQRP of the surface of the third perspective table of cubes.

From the points *u*, *v*, *w*, *x*, draw upright lines to OP, all parallel to *t* O, and you will have the outer surfaces of the five cubes in the side O *y* of this third table.

From the points where these upright lines meet OP, draw lines toward the point of sight S, till they meet the diagonal PQ; and from these points of meeting draw lines to PR, all parallel to OP, making the parts 2, 3, 4, 5, of these lines with black ink which lie between ZY and PR. Then, from the points where these lines meet PR, draw lines down to *y* N; which will bound the outer surfaces of the five cubes in the side PN of the third table.

Draw the line *∂* 1 with black ink; and, at a fourth part of its length between *∂* and Z, draw an upright line to S, equal in length to that fourth part, and another equal and parallel thereto from Z to V: then draw SV parallel to *∂* Z, and draw the two upright and equidistant lines between *∂* Z and SV, and you will have the outer surfaces of the three cubes in the side SZ of the fourth table.

Draw SS and VS to the point of sight S in the horizon, and VP to the point of distance therein, intersecting SS in T; then draw TU parallel to SV, and you have STUV, the surface of the fourth table, which being reticulated or divided into 9 perspective small squares, and the uppermost cube W placed on the middlemost of the squares, all the outlines will be finished; and when the whole is properly shaded, as in fig. 27. the work will be done.

Prob. 25. *To represent a double cross in perspective.*

In fig. 29. let ABCD and EFGH be the two perspective squares, equal and parallel to one another, the uppermost directly above the lowermost, drawn by the rules already laid down, and as far asunder as is equal to the given height of the upright part of the cross; S being the point of sight, and P the point of distance, in the horizon PS taken parallel to AD. Fig. 29.

Draw AE, DH, and CG; then AEHD and DHGC shall be the two visible sides of the upright part of the cross; of which, the length AE is here made equal to three times the breadth EH.

Divide DH into three equal parts, HI, IK, and KD. Through these points of division, at I and K, draw MO and PR parallel to AD: and make the parts MN, IO, PQ, KR, each equal to HI: then draw MP and OR parallel to DH.

From M and O, draw MS and OS to the point of sight S; and from the point of distance P draw PN cutting MS in T: from T draw TU parallel to MO, and meeting OS in U; and you will have the uppermost surface MTUO of one of the cross pieces of the figure.——From R, draw RS to the point of sight S; and from U draw UV parallel to OR; and OUVR shall be the perspective square end next the eye of that cross part.

Draw PMX (as long as you please) from the point of distance P, through the corner M; lay a ruler to N and S, and draw XN from the line PX:—then lay the ruler to I and S, and draw YZS.—Draw XY parallel to MO, and make XW and YB equal and perpendicular to XY: then draw WB parallel to XY, and WXYB shall be the square visible end of the other cross part of the figure.

Draw BK toward the point of sight S; and from U draw UP to the point of distance P, intersecting YS in Z: then, from the intersection Z, draw Z *a* parallel to MO, and Z *b* parallel to HD, and the whole delineation will be finished.

This done, shade the whole, as in fig. 30. and you will have a true perspective representation of a double cross. Fig. 30.

Prob. 26. *To put three rows of upright square objects in perspective, equal in size, and at equal distances from each other, on an oblong square plane, the breadth of which shall be of any assigned proportion to the length thereof.*

Fig. 31. is a perspective representation of an oblong square plane, three times as long as it is broad, having a row of nine upright square objects on each side, and one of the same number in the middle; all equally high, and at equal distances from one another, both long-wise and cross-wise, on the same plane. Fig. 31.

In fig. 32. PS is the horizon, S the point of sight, P the Fig. 32.

the point of diſtance, and AD (parallel to PS) the breadth of the plane.

Draw AS, NS, and DS, to the point of ſight S; the point N being in the middle of the line AD: and draw DP to the point of diſtance P, interſecting AS in the point B: then, from B draw BC parallel to AD, and you have the perſpective ſquare ABCD.

Through the point *i*, where DB interſects NS, draw *a e* parallel to AD; and you will have ſubdivided the perſpective ſquare ABCD into four leſſer ſquares, as A *a i* N, N *i c* D, *a* B *k i*, and *i k* C *c*.

From the point C (at the top of the perſpective ſquare ABCD) draw CP to the point of diſtance P, interſecting AS in E; then from the point E draw EF parallel to AD; and you will have the ſecond perſpective ſquare BEFC.

Through the point *l*, where CE interſects NS, draw *b f* parallel to AD; and you will have ſubdivided the ſquare BEFC into the four ſquares B *b l k*, *k l f* C, *b* E *m l*, and *l m* F *f*.

From the point F (at the top of the perſpective ſquare BEFC) draw FP to the point of diſtance P, interſecting AS in I; then from the point I draw IK parallel to AD; and you will have the third perſpective ſquare EIKF.

Through the point *n*, where FI interſects NS, draw *e g* parallel to AD; and you will have ſubdivided the ſquare EIKF into four leſſer ſquares, E *e n m*, *m n g* F, *e* I *o n*, and *n o* K *g*.

From the point K (at the top of the third perſpective ſquare EIKF) draw KP to the point of diſtance P, interſecting AS in L; then from the point L draw LM parallel to AD; and you will have the fourth perſpective ſquare ILMK.

Through the point *p*, where KL interſects NS, draw *d h* parallel to AD; and you will have ſubdivided the ſquare ILMK into the four leſſer ſquares I *d p o*, *o p h* K, *d* L *q p*, and *p q* M *h*.

Thus we have formed an oblong ſquare ALMD, whoſe perſpective length is equal to four times its breadth, and it contains 16 equal perſpective ſquares.—If greater length was ſtill wanted, we might proceed further on toward S.

Take A 3, equal to the intended breadth of the ſide of the upright ſquare object AQ (all the other ſides being of the ſame breadth), and AO for the intended height. Draw O 18 parallel to AD, and make D 8 and 4 7 equal to A 3; then draw 3 S, 4 S, 7 S, and 8 S to the point of ſight S; and among them we ſhall have the perſpective ſquare baſes of all the 27 upright objects on the plane.

Through the point 9, where DB interſects 8 S, draw 1 10 parallel to AD, and you have the three perſpective ſquare baſes A 1 2 3, 4 5 6 7, 8 9 10 D, of the three upright ſquare objects at A, N, and D.

Through the point 21, where *e b* interſects 8 S, draw 14, 11 parallel to AD; and you will have the three perſpective ſquares *a* 14 15 16 17 18 19 20, and 21 11 *e* 22, for the baſes of the ſecond croſs row of objects; namely, the next beyond the firſt three at A, N, and D.

Through the point *w*, where CE interſects 8 S, draw a line parallel to BC; and you will have three perſpective ſquares, at B, *k*, and C, for the baſes of the third row of objects; one of which is ſet up at B.

Through the point *x*, where *f c* interſects 8 S, draw a line parallel to *b f*; and you will have three perſpective ſquares, at *b*, *l*, and *x*, for the baſes of the fourth croſs row of objects.

Go on in this manner, as you ſee in the figure, to find the reſt of the ſquare baſes, up to LM; and you will have 27 upon the whole oblong ſquare plane, on which you are to place the like number of objects, as in fig. 31.

Having aſſumed AO for the perſpective height of the three objects at A, N, and D (fig. 32.) next the obſerver's eye, and drawn O 18 parallel to AD, in order to make the objects at N and D of the ſame height as that at O; and having drawn the upright lines 4 15, 7 W, 8 X, and D 22, for the heights at N and D; draw OS and RS, 15 S and WS, XS and 22 S, all to the point of ſight S: and theſe lines will determine the perſpectively equal heights of all the reſt of the upright objects, as ſhown by the two placed at *a* and B.

To draw the ſquare tops of theſe objects, equal and parallel to their baſes, we need only give one example, which will ſerve for all.

Draw 3 R and 2 Q parallel to AO, and up to the line RS; then draw PQ parallel to OR, and OPQR ſhall be the top of the object at A, equal and parallel to its ſquare baſe A 1 2 3.—In the ſame eaſy way the tops of all the other objects are formed.

When all the reſt of the objects are delineated, ſhade them properly, and the whole perſpective ſcheme will have the appearance of fig. 31.

Prob. 27. *To put a ſquare box in perſpective, containing a given number of leſſer ſquare boxes of a depth equal to their width.*

Let the given number of little ſquare boxes or cells be 16, then 4 of them make the length of each ſide of the four outer ſides *a b*, *b c*, *c d*, *d a*, as in fig. 33. and the depth *a f* is equal to the width *a e*. Whoever can draw the reticulated ſquare, by the rules laid down towards the beginning of this article, will be at no loſs about putting this perſpective ſcheme in practice. Fig. 33.

Prob. 28. *To put ſtairs with equal and parallel ſteps in perſpective.*

In fig. 34. let *a b* be the given breadth of each ſtep, and *a i* the height thereof. Make *b c*, *c d*, *d e*, &c. each equal to *a b*; and draw all the upright lines *a i*, *b l*, *c n*, *d p*, &c. perpendicular to *a h* (to which the horizon *s* S is parallel); and from the points *i*, *l*, *n*, *p*, *r*, &c. draw the equidiſtant lines *i* B, *l* C, *n* D, &c. parallel to *a h*; theſe diſtances being equal to that of *i* B from *a h*. Fig. 34.

Draw *x i* touching all the corner-points *l*, *n*, *p*, *r*, *t*, *v*; and draw 2 16 parallel to *x i*, as far from it as you want the length of the ſteps to be.

Toward the point of ſight S draw the lines *a* 1, *i* 2, *k* 3, *l* 4, &c. and draw 16 15, 14 13, 12 11, 10 9, 8 7, 6 5, 4 3, and 2 1, all parallel to A *h*, and meeting the lines *w* 15, *u* 13, *s* 11, &c. in the points 15, 13, 11, 9, 7, 5, 3, and 1: then from theſe points draw 15 14, 13 12, 11 10, 9 8, 7 6, 5 4, and 3 2, all parallel to *h a*; and the outlines of the ſteps will be finiſhed. From the point 16 draw 16 A parallel to *h a*, and A *x* 16 will be part of the flat at the top of the uppermoſt ſtep.

Z 2 This

Fig. 35. This done, ſhade the work as in fig. 35. and the whole will be finiſhed.

PROB. 29. *To put ſtairs with flats and opening in perſpective, ſtanding on a horizontal pavement of ſquares.*

Fig. 36. In fig. 36. having made S the point of ſight, and drawn a reticulated pavement AB with black lead lines, which may be rubbed out again; at any diſtance from the ſide AB of the pavement which is neareſt to the eye, and at any point where you chooſe to begin the ſtair at that diſtance, as *a*, draw G *a* parallel to BA, and take *a b* at pleaſure for the height of each ſtep.

Take *a b* in your compaſſes, and ſet that extent as many times upward from F to E as is equal to the firſt required number of ſteps O, N, M, L, K; and from theſe points of diviſion in EF draw 1 *b*, 2 *d*, 3 *f*, 4 *h*, and E *k*, all equidiſtant from one another, and parallel to F *a*: then draw the equidiſtant upright lines *a b*, *t d*, *u f*, *v h*, *w k*, and I *m*, all perpendicular to F *a*: then draw *m b*, touching the outer corners of theſe ſteps at *m*, *k*, *h*, *f*, *d*, and *b*; and draw *n s* parallel to *m b*, as far from it as you want the length of the ſteps K, L, M, N, O to be.

Towards the point of ſight S draw *m n*, *l* 5, *k o*, *i* 6, *h p*, *f q*, *d r*, and *b s*. Then (parallel to the bottom-line BA) through the points *n*, *o*, *p*, *q*, *r*, *s*, draw *n* 8; 5, 14; 6, 15; 7, 16; 1, 17; and 2 *s*: which done, draw *n* 5 and *o* 6 parallel to *l m*, and the outlines of the ſteps K, L, M, N, O will be finiſhed.

At equal diſtances with that between the lines marked 8 and 14, draw the parallel lines above marked 9 10 11 12 and 13; and draw perpendicular lines upwards from the points *n*, *o*, *p*, *q*, *r*, *s*, as in the figure.

Make H *m* equal to the intended breadth of the flat above the ſquare opening at the left hand, and draw HW toward the point of ſight S, equal to the intended length of the flat; then draw WP parallel to H *m*, and the outlines of the flat will be finiſhed.

Take the width of the opening at pleaſure, as from F to C, and draw CD equal and parallel to FE. Draw GH parallel to CD, and the ſhort lines marked 33, 34, &c. juſt even with the parallel lines 1, 2, &c. From the points where theſe ſhort lines meet CD draw lines toward the point of ſight S till they meet DE; then from the points where the lines 38, 39, 40, &c. of the pavement meet C *y*, draw upright lines parallel to CD; and the lines which form the opening will be finiſhed.

The ſteps P, Q, R, S, T, and the flat U above the arch V, are done in the ſame manner with thoſe in fig. 34. as taught in Prob. 28. and the equidiſtant parallel lines marked 18, 19, &c. are directly even with thoſe on the left-hand ſide of the arch V, and the upright lines on the right-hand ſide are equidiſtant with thoſe on the left.

From the points where the lines 18, 19, 20, &c. meet the right-hand ſide of the arch, draw lines toward the point of ſight S; and from the points where the pavement lines 29, 30, 31, 32, meet the line drawn from A towards the point of ſight, draw upright lines toward the top of the arch.

Having done the top of the arch, as in the figure, and the few ſteps to the right hand thereof, ſhade the

Fig. 37. whole as in fig. 37. and the work will be finiſhed.

PROB. 30. *To put upright conical objects in perſpective, as if ſtanding on the ſides of an oblong ſquare, at diſtances from one another equal to the breadth of the oblong.*

In fig. 38. the baſes of the upright cones are perſpective circles inſcribed in ſquares of the ſame diameter; and the cones are ſet upright on their baſes by the ſame rules as are given for pyramids, which we need not repeat here. Fig. 38.

In moſt of the foregoing operations we have conſidered the obſerver's eye to be above the level of the tops of all the objects, as if he viewed them when ſtanding on high ground. In this figure, and in fig. 41. and fig. 42. we ſhall ſuppoſe him to be ſtanding on low ground, and the tops of the objects to be above the level of his eye.

In fig. 38. let AD be the perſpective breadth of the oblong ſquare ABCD; and let A *a* and D *d* (equal to A *a*) be taken for the diameters of the circular baſes of the two cones next the eye, whoſe intended equal heights ſhall be AE and DF. Fig. 38.

Having made S the point of ſight in the horizon parallel to AD, and found the proper point of diſtance therein, draw AS and *a* S to contain the baſes of the cones on the left-hand ſide, and DS and *d* S for thoſe on the right.

Having made the two firſt cones at A and D of equal height at pleaſure, draw ES and FS from their tops to the point of ſight, for limiting the perſpective heights of all the reſt of the cones. Then divide the parallelogram ABCD into as many equal perſpective ſquares as you pleaſe; find the baſes of the cones at the corners of theſe ſquares, and make the cones thereon, as in the figure.

If you would repreſent a ceiling equal and parallel to ABCD, ſupported on the tops of theſe cones, draw EF, then EFGH ſhall be the ceiling; and by drawing *e f* parallel to EF, you will have the thickneſs of the floor-boards and beams, which may be what you pleaſe.

This ſhows how any number of equidiſtant pillars may be drawn of equal heights to ſupport the ceiling of a long room, and how the walls of ſuch a room may be repreſented in perſpective at the backs of theſe pillars. It alſo ſhows how a ſtreet of houſes may be drawn in perſpective.

PROB. 31. *To put a ſquare hollow in perſpective, the depth of which ſhall bear any aſſigned proportion to its width.*

Fig. 41. is the repreſentation of a ſquare hollow, of which the depth AG is equal to three times its width AD; and S is the point of ſight over which the obſerver's eye is ſuppoſed to be placed, looking perpendicularly down into it, but not directly over the middle. Fig. 41.

Draw AS and DS to the point of ſight S; make ST the horizon parallel to AD, and produce it to ſuch a length beyond T that you may find a point of diſtance therein not nearer S than if AD was ſeen under an angle of 60 degrees.

Draw DU to the point of diſtance, interſecting AS in B; then from the point B draw BC parallel to AD;

and

and you will have the first perspective square ABCD, equal to a third part of the intended depth.

Draw CV to the point of distance, intersecting AS in E; then from the point E draw EF parallel to AD; and you will have the second perspective square BEFC, which, added to the former one, makes two-thirds of the intended depth.

Draw FW to the point of distance, intersecting AS in G; then from the point G draw GH parallel to AD; and you will have the third perspective square EGHF, which, with the former two, makes the whole depth AGHD three times as great as the width AD, in a perspective view.

Divide AD into any number of equal parts, as suppose 8; and from the division-points *a*, *b*, *c*, *d*, &c. draw lines toward the point of sight S, and ending at GH; then through the points where the diagonals BD, EC, GF, cut these lines, draw lines parallel to AD; and you will have the parallelogram AGHD reticulated, or divided into 192 small and equal perspective squares.

Make AI and DM equal and perpendicular to AD; then draw IM, which will be equal and parallel to AD; and draw IS and MS to the point of sight S.

Divide AI, IM, and MD, into the same number of equal parts as AD is divided; and from these points of division draw lines toward the point of sight S, ending respectively at GK, KL, and LH.

From those points where the lines parallel to AD meet AG and DH draw upright lines parallel to AI and DM; and from the points where these lines meet IK and LM draw lines parallel to IM; then shade the work, as in the figure.

PROB. 32. *To represent a semicircular arch in perspective, as if it were standing on two upright walls, equal in height to the height of the observer's eye.*

Fig. 42. After having gone through the preceding operation, this will be more easy by a bare view of fig. 42. than it could be made by any description; the method being so much like that of drawing and shading the square hollow.—We need only mention, that *a* T *b* EA and DF*ctd* are the upright walls on which the semicircular arch is built; that S is the point of sight in the horizon T *t*, taken in the centre of the arch; and *d* in fig. 41. is the point of distance; and that the two perspective squares ABCD and BEFC make the parallelogram AEFD of a length equal to twice its breadth AD.

PROB. 33. *To represent a square in perspective, as viewed by an observer standing directly even with one of its corners.*

Fig. 43. In fig. 43. let A 9 BC be a true square, viewed by an observer standing at some distance from the corner C, and just even with the diagonal C 9.

Let *p* SP be the horizon, parallel to the diagonal AB; and S the point of sight, even with the diagonal C 9. Here it will be proper to have two points of distance *p* and P, equidistant from the point of sight S.

Draw the straight line 1 17 parallel to AB, and draw A 8 and B 10 parallel to CS. Take the distance between 8 and 9 in your compasses, and set it off all the way in equal parts from 8 to 1, and from 10 to 17.—The line 1 17 should be produced a good way further both to right and left hand from 9, and divided all the way in the same manner.

From these points of equal division, 8, 9, 10, &c. draw lines to the point of sight S, and also to the two points of distance *p* and P, as in the figure.

Now it is plain, that *a c b* 9 is the perspective representation of A 9 BC, viewed by an observer even with the corner C and diagonal C 9.—But if there are other such squares lying even with this, and having the same position with respect to the line 1 17, it is evident that the observer, who stands directly even with the corner C of the first square, will not be even with the like corners G and K of the others; but will have an oblique view of them, over the sides FG and IK, which are nearest his eye: and their perspective representations will be *e g f* 6 and *h k i* 3, drawn among the lines in the figure: of which the spaces taken up by each side lie between three of the lines drawn toward the point of distance *p*, and three drawn to the other point of distance P.

PROB. 34. *To represent a common chair, in an oblique perspective view.*

The original lines to the point of sight S, and points Fig. 43. of distance *p* and P, being drawn as in the preceding operation, choose any part of the plane, as *l m n* 13, on which you would have the chair L to stand.—There are just as many lines (namely two) between *l* and *m* or 13 and *n*, drawn toward the point of distance *p*, at the left hand, as between *l* and 13, or *m* and *n*, drawn to the point of distance P on the right: so that *l m*, *m n*, *n* 13, and 13 *l*, form a perspective square.

From the four corners *l*, *m*, *n*, 13, of this square raise the four legs of the chair to the perspective perpendicular height you would have them: then make the seat of the chair a square equal and parallel to *l m n* 13, as taught in Prob. 18. which will make the two sides of the seat in the direction of the lines drawn toward the point of distance *p*, and the fore and back part of the seat in direction of the lines drawn to the other point of distance P. This done, draw the back of the chair leaning a little backward, and the cross bars therein tending toward the point of distance P. Then shade the work as in the figure; and the perspective chair will be finished.

PROB. 35. *To present an oblong square table in an oblique perspective view.*

In fig. 43. M is an oblong square table, as seen by Fig. 43. an observer standing directly even with C 9 (see Prob. 33.), the side next the eye being perspectively parallel to the side *a c* of the square *a b c* 9.—The forementioned lines drawn from the line 1 17 to the two points of distance *p* and P, form equal perspective squares on the ground plane.

Choose any part of this plane of squares for the feet of the table to stand upon; as at *p*, *q*, *r*, and *s*, in direction of the lines *o p* and *r s* for the two long sides, and *t s* and *q r* for the two ends; and you will have the oblong square or parallelogram *q r s t* for the part of the floor or ground-plane whereon the table is to stand: and the breadth of this plane is here taken in proportion to the length as 6 to 10; so that, if the length of the table be ten feet, its breadth will be six.

On the four little perspective squares at *q*, *r*, *s*, and *t*,

t, place the four upright legs of the table, of what height you pleafe, fo that the height of the two next the eye, at *o* and *p*, fhall be terminated by a ftraight line *u v* drawn to the point of diftance P. This done, make the leaf M of the table an oblong fquare, perfpectively equal and parallel to the oblong fquare *q r s t* on which the feet of the table ftands. Then fhade the whole, as in the figure, and the work will be finifhed.

If the line 1 17 were prolonged to the right and left hand, and equally divided throughout (as it is from 1 to 17), and if the lines which are drawn from *p* and P to the right and left hand fides of the plate were prolonged till they came to the extended line 1 17, they would meet it in the equal points of divifion. In forming large plans of this fort, the ends of flips of paper may be pafted to the right and left edges of the fheet on which the plan is to be formed.

Of the Anamorphofis, or reformation of diftorted images.

By this means pictures that are fo mifhapen, as to exhibit no regular appearance of any thing to the naked eye, fhall, when viewed by reflection, prefent a regular and beautiful image. The inventor of this ingenious device is not known. Simon Stevinus, who was the firft that wrote upon it, does not inform us from whom he learned it. The principles of it are laid down by S. Vauzelard in his *Perfpective Conique et Cylindrique*; and Gafpar Schott profeffes to copy Marius Bettinus in his defcription of this piece of artificial magic.

It will be fufficient for our purpofe to copy one of the fimpleft figures of this writer, as by this means the myftery of this art will be fufficiently unfolded. Upon the Fig. 44. cylinder of paper, or pafteboard, ABCD, fig. 44. draw whatever is intended to be exhibited, as the letters IHS. Then with a needle make perforations along the whole outline; and placing a candle, G, behind this cylinder, mark upon the ground plane the fhadow of them, which will be diftorted more or lefs, according to the pofition of the candle or the plane, &c. This being done, let the picture be an exact copy of this diftorted image, let a metallic fpeculum be fubftituted in the place of the cylinder, and let the eye of the fpectator have the fame pofition before the cylinder that the candle had behind it. Then looking upon the fpeculum, he will fee the diftorted image reftored to its proper fhape. The reformation of the image, he fays, will not eafily be made exact in this method, but it will be fufficiently fo to anfwer the purpofe.

Other methods, more exact and geometrical than this, were found out afterwards: fo that thefe pictures could be drawn by certain rules, without the ufe of a candle. Schott quotes one of thefe methods from Bettinus, another from Herigonius, and another from Kircher, which may be feen in his *Magia*, vol. i. p. 162, &c. He alfo gives an account of the methods of reforming pictures by fpeculums of conical and other figures.

Inftead of copying any of thefe methods from Schott or Bettinus, we fhall prefent our readers with that which Dr Smith hath given us in his Optics, vol. i. p. 250, as, no doubt, the beft, and from which any perfon may Fig. 39. and 40. eafily make a drawing of this kind. The fame defcription anfwers to two mirrors, one of which, fig. 39. is convex, and the other, fig. 40. is concave.

In order to paint upon a plane a deformed copy ABCDEKIHGF of an original picture, which fhall appear regular, when feen from a given point O, elevated above the plane, by rays reflected from a polifhed cylinder, placed upon the circle *l n p*, equal to its given bafe; from the point R, which muft be fuppofed to lie perpendicularly under O, the place of the eye, draw two lines R *a*, R *e*; which fhall either touch the bafe of the cylinder, or elfe cut off two fmall equal fegments from the fides of it, according as the copy is intended to be more or lefs deformed. Then, taking the eye, raifed above R, to the given height RO, fomewhat greater than that of the cylinder, for a luminous point, defcribe the fhadow *a e k f* (of a fquare, fig. 39. or parallelogram ftanding upright upon *a e* Fig. 39. as a bafe, and containing the picture required) anywhere behind the arch *l n p*. Let the lines drawn from R to the extremities and divifions of the bafe *a*, *b*, *c*, *d*, *e*, cut the remoteft part of the fhadow in the points *f*, *g*, *h*, *i*, *k*, and the arch of the bafe in *l*, *m*, *n*, *o*, *p*; from which points draw the lines *l* AF, *m* BG, *n* CH, *o* DI, *p* EK, as if they were rays of light that came from the focus R, and were reflected from the bafe *l n p*; fo that each couple, *l* A, *l* R, produced, may cut off equal fegments from the circle. Laftly, Transfer the lines *l a f*, *m b g*, &c. and all their parts in the fame order, upon the refpective lines *l* AF, *m* BG, &c. and having drawn regular curves, by eftimation, through the points A, B, C, D, E, through F, G, H, I, K, and through every intermediate order of points; the figure ACEKHF, fo divided, will be the deformed copy of the fquare, drawn and divided upon the original picture, and will appear fimilar to it, when feen in the polifhed cylinder, placed upon the bafe *l n p*, by the eye in its given place O.

The practical methods of drawing thefe images feem to have been carried to the greateft perfection by J. Leopold, who, in the Acta Lipfienfia for the year 1712, has defcribed two machines, one for the images to be viewed with a cylindrical, and the other with a conical mirror. The perfon poffeffed of this inftrument has nothing to do but to take any print he pleafes, and while he goes over the outlines of it with one pen, another traces the anamorphofis.

By methods of this kind, groves of trees may be cut, fo as to reprefent the appearance of men, horfes, and other objects from fome one point of view, which are not at all difcernible in any other. This might eafily be effected by one perfon placing himfelf in any particular fituation, and giving directions to other perfons what trees to lop, and in what manner. In the fame method it has been contrived, that buildings of circular and other forms, and alfo whole groups of buildings confifting of walls at different diftances and with different pofitions to one another, fhould be painted fo as to exhibit the exact reprefentation of particular objects, which could only be perceived in one fituation. Bettinus has illuftrated this method by drawings in his *Apiaria*.

It may appear a bold affertion to fay, that the very fhort fketch now given of the art of perfpective is a fufficient foundation for the whole practice, and includes *all* the expeditious rules peculiar to the problems which moft generally occur. It is, however, true, and the intelligent

telligent reader will ſee, that the two theorems on which the whole reſts, include every poſſible caſe, and apply with equal facility to pictures and originals in any poſition, although the examples are ſelected of perpendicular pictures, and of originals referred to horizontal planes, as being the moſt frequent. The ſcientific foundation being ſo ſimple, the ſtructure need not be complex, nor ſwell into ſuch volumes as have been publiſhed on the ſubject: volumes which by their ſize deter from the peruſal, and give the ſimple art the appearance of intricate myſtery; and by their prices, defeat the deſign of their authors, viz. the diſſemination of knowledge among the practitioners. The treatiſes on perſpective acquire their bulk by long and tedious diſcourſes, minute explanations of common things, or by great numbers of examples; which indeed do make ſome of theſe books valuable by the variety of curious cuts, but do not at all inſtruct the reader by any improvements made in the art itſelf. For it is evident that moſt of thoſe who have treated this ſubject have been more converſant in the practice of deſigning than in the principles of geometry; and therefore when, in their practice, the caſes which have offered have put them on trying particular expedients, they have thought them worth communicating to the public as improvements in the art; and each author, fond of his own little expedient, (which a ſcientific perſon would have known for an eaſy corollary from the general theorem), has made it the principle of a practical ſyſtem—in this manner narrowing inſtead of enlarging the knowledge of the art; and the practitioner tired of the bulk of the volume, in which a ſingle maxim is tediouſly ſpread out, and the principle on which it is founded kept out of his ſight, contents himſelf with a remembrance of the maxim (not underſtood), and keeps it ſlightly in his eye to avoid groſs errors. We can appeal to the whole body of painters and draughtſmen for the truth of this aſſertion; and it muſt not be conſidered as an imputation on them of remiſſneſs or negligence, but as a neceſſary conſequence of the ignorance of the authors from whom they have taken their information. This is a ſtrong term, but it is not the leſs juſt. Several mathematicians of eminence have written on perſpective, treating it as the ſubject of pure geometry, as it really is; and the performances of Dr Brook Taylor, Graveſande, Wolf, De la Caille, Emerſon, are truly valuable, by preſenting the art in all its perſpicuous ſimplicity and univerſality. The works of Taylor and Emerſon are more valuable, on account of the very ingenious and expeditious conſtructions which they have given, ſuited to every poſſible caſe. The merit of the firſt author has been univerſally acknowledged by all the Britiſh writers on the ſubject, who never fail to declare that their own works are compoſed on the principle of Dr Brook Taylor; but any man of ſcience will ſee that theſe authors have either not underſtood them, or aimed at pleaſing the public by fine cuts and uncommon caſes; for without exception, they have omitted his favourite conſtructions, which had gained his predilection by their univerſality, and attached themſelves to inferior methods, more uſually expedient perhaps, or inventions (as they thought) of their own. What has been given in this article is not *profeſſed* to be according to the principles of Dr Brook Taylor, becauſe the principles are not peculiar to him, but the neceſſary reſults of the theory itſelf, and inculcated by every *mathematician* who had taken the trouble to conſider the ſubject. They are ſufficient not only for directing the ordinary practice, but alſo for ſuggeſting modes of conſtruction for every caſe out of the common track. And a perſon of ingenuity will have a laudable enjoyment in this, without much ſtretch of thought, inventing rules for himſelf; and will be better pleaſed with ſuch fruits of his own ingenuity, than in reading the tedious explanation of examples deviſed by another. And for this purpoſe we would, with Dr Taylor, "adviſe all our readers not to be contented with the ſcheme they find here; but, on every occaſion, to draw new ones of their own, in all the variety of circumſtances they can think of. This will take up more time at firſt, but they will find the vaſt benefit and pleaſure of it by the extenſive notions it will give them of the nature of the principles."

The art of perſpective is neceſſary to all arts where there is any occaſion for deſigning; as architecture, fortification, carving, and generally all the mechanical arts; but it is more particularly neceſſary to the art of painting, which can do nothing without it. A figure in a picture, which is not drawn according to the rules of perſpective, does not repreſent what is intended, but ſomething elſe. Indeed we heſitate not to ſay, that a picture which is faulty in this particular, is as blameable, or more ſo, than any compoſition in writing which is faulty in point of orthography or grammar. It is generally thought very ridiculous to pretend to write a heroic poem, or a fine diſcourſe, upon any ſubject, without underſtanding the propriety of the language in which we write; and to us it ſeems no leſs ridiculous for one to pretend to make a good picture without underſtanding perſpective: Yet how many pictures are there to be ſeen, that are highly valuable in other reſpects, and yet are entirely faulty in this point? Indeed this fault is ſo very general, that we cannot remember that we ever have ſeen a picture that has been entirely without it; and what is the more to be lamented, the greateſt maſters have been the moſt guilty of it. Thoſe examples make it to be the leſs regarded; but the fault is not the leſs, but the more to be lamented, and deſerves the more care in avoiding it for the future. The great occaſion of this fault, is certainly the wrong method that is generally uſed in educating of perſons in this art: for the young people are generally put immediately to drawing; and when they have acquired a facility in that, they are put to colouring. And theſe things they learn by rote, and by practice only; but are not at all inſtructed in any rules of art. By which means, when they come to make any deſigns of their own, though they are very expert at drawing out and colouring every thing that offers itſelf to their fancy; yet for want of being inſtructed in the ſtrict rules of art, they do not know how to govern their inventions with judgment, and become guilty of ſo many groſs miſtakes; which prevent themſelves, as well as others, from finding that ſatisfaction they otherwiſe would do in their performances. To correct this for the future, we would recommend it to the maſters of the art of painting, to conſider if it would not be neceſſary to eſtabliſh a better method for the education of their ſcholars, and to begin their inſtructions with the technical parts of painting, before they let them looſe to follow the inventions of their own uncultivated imaginations.

The

The art of painting, taken in its full extent, confifts of two parts; the inventive, and the executive. The inventive part is common with poetry, and belongs more properly and immediately to the original defign (which it invents and difpofes in the moft proper and agreeable manner) than to the picture, which is only a copy of that defign already formed in the imagination of the artift. The perfection of this art of painting depends upon the thorough knowledge the artift has of all the parts of his fubject; and the beauty of it confifts in the happy choice and difpofition that he makes of it: And it is in this that the genius of the artift difcovers and fhows itfelf, while he indulges and humours his fancy, which here is not confined. But the other, the executive part of painting, is wholly confined and ftrictly tied to the rules of art, which cannot be difpenfed with upon any account; and therefore in this the artift ought to govern himfelf entirely by the rules of art, and not to take any liberties whatfoever. For any thing that is not truly drawn according to the rules of perfpective, or not truly coloured or truly fhaded, does not appear to be what the artift intended, but fomething elfe. Wherefore, if at any time the artift happens to imagine that his picture would look the better, if he fhould fwerve a little from thefe rules, he may affure himfelf, that the fault belongs to his original defign, and not to the ftrictnefs of the rules; for what is perfectly agreeable and juft in the real original objects themfelves, can never appear defective in a picture where thofe objects are exactly copied.

Therefore to offer a fhort hint of thoughts we have fome time had upon the method which ought to be followed in inftructing a fcholar in the executive part of painting: we would firft have him learn the moft common affections of practical geometry, and the firft elements of plain geometry and common arithmetic. When he is fufficiently perfect in thefe, we would have him learn perfpective. And when he has made fome progrefs in this, fo as to have prepared his judgment with the right notions of the alterations that figures muft undergo, when they come to be drawn on a flat, he may then be put to drawing by view, and be exercifed in this along with perfpective, till he comes to be fufficiently perfect in both. Nothing ought to be more familiar to a painter than perfpective; for it is the only thing that can make the judgment correct, and will help the fancy to invent with ten times the eafe that it could do without it.

We earneftly recommend to our readers the *careful* perufal of Dr Taylor's Treatife, as publifhed by Colfon in 1749, and Emerfon's publifhed along with his Optics. They will be furprifed and delighted with the inftruction they will receive; and will then truly eftimate the fplendid volumes of other authors and fee their frivolity.

Perfpective. PERSPECTIVE is alfo ufed for a kind of picture or painting, frequently feen in gardens, and at the ends of galleries; defigned exprefsly to deceive the fight by reprefenting the continuation of an alley, a building, landfcape, or the like.

Aerial PERSPECTIVE, is fometimes ufed as a general denomination for that which more reftrictedly is called *aerial perfpective*, or the art of giving a due diminution or degradation to the ftrength of light, fhade, and colours of objects, according to their different diftances, the quantity of light which falls upon them, and the medium through which they are feen; the *chiaro obfcuro*, or *clair obfcure*, which confifts in expreffing the different degrees of light, fhade, and colour of bodies, arifing from their own fhape, and the pofition of their parts with refpect to the eye and neighbouring objects, whereby their light or colours are affected; and keeping, which is the obfervance of a due proportion in the general light and colouring of the whole picture, fo that no light or colour in one part may be too bright or ftrong for another. A painter, who would fucceed in *aerial perfpective*, ought carefully to ftudy the effects which diftance, or different degrees or colours of light, have on each particular original colour, to know how its hue or ftrength is changed in the feveral circumftances that occur, and to reprefent it accordingly. As all objects in a picture take their meafures in proportion to thofe placed in the front, fo, in *aerial perfpective*, the ftrength of light, and the brightnefs of the colours of objects clofe to the picture, muft ferve as a meafure, with refpect to which all the fame colours at feveral diftances muft have a proportional degradation in like circumftances. Perfpective.

Bird's eye view in PERSPECTIVE, is that which fuppofes the eye to be placed above any building, &c. as in the air at a confiderable diftance from it. This is applied in drawing the reprefentations of fortifications, when it is neceffary not only to exhibit one view as feen from the ground, but fo much of the feveral buildings as the eye can poffibly take in at one time from any fituation. In order to this, we muft fuppofe the eye to be removed a confiderable height above the ground, and to be placed as it were in the air, fo as to look down into the building like a bird that is flying. In reprefentations of this kind, the higher the horizontal line is placed, the more of the fortification will be feen, and *vice verfa*.

PERSPECTIVE *Machine*, is an inftrument by which any perfon, without the help of the rules of art, may delineate the true perfpective figures of objects. Mr Fergufon has defcribed a machine of this fort, of which he afcribes the invention to Dr Bevis.

Fig. 45. is a plan of this machine, and fig. 46. is a reprefentation of it when made ufe of in drawing diftant objects in perfpective. Fig. 45. and 46.

In fig. 45. *a b e f* is an oblong fquare board, reprefented by ABEF in fig. 46. *x* and *y* (X and Y) are two hinges on which the part *c l d* (CLD) is moveable. This part confifts of two arches or portions of circles *cml* (CML) and *dnl* (DNL) joined together at the top *l* (L), and at bottom to the crofs bar *d c* (DC), to which one part of each hinge is fixed, and the other part

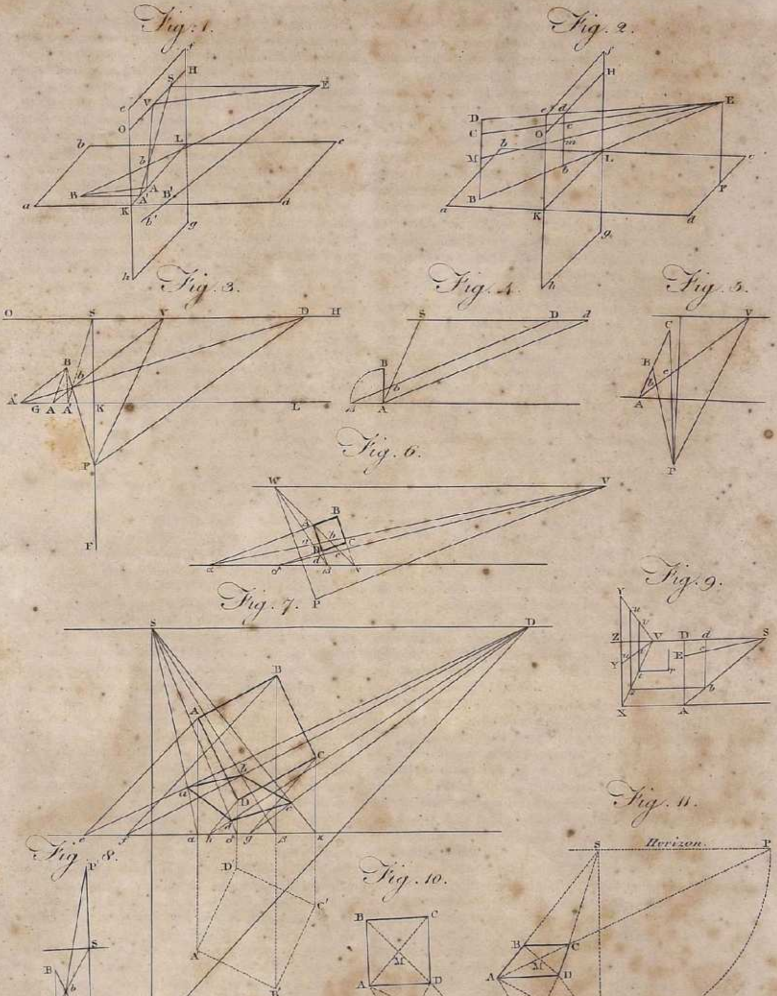


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Horizon.

Fig. 13.

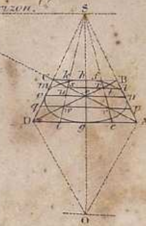


Fig. 14.

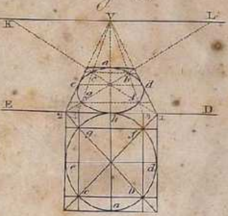


Fig. 15.

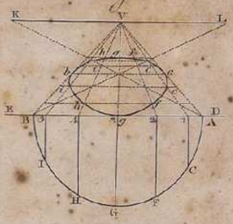


Fig. 12.

Fig. 16.

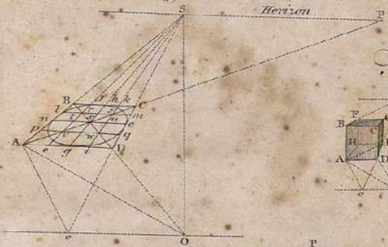


Fig. 18.

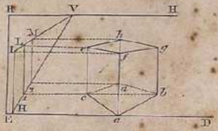


Fig. 17.

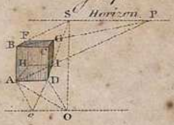


Fig. 21.

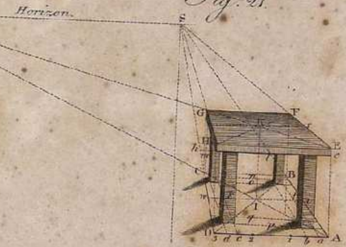


Fig. 19.

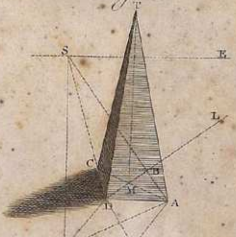


Fig. 20.

Fig. 24.

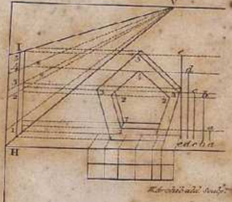


Fig. 22.

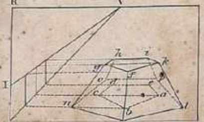
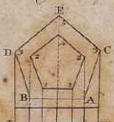
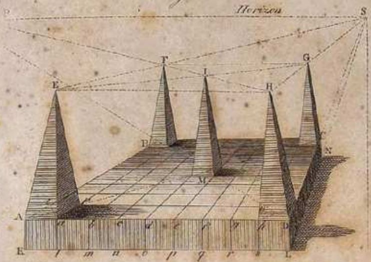


Fig. 23.



M. Archibald Sculpt.

Fig. 25.



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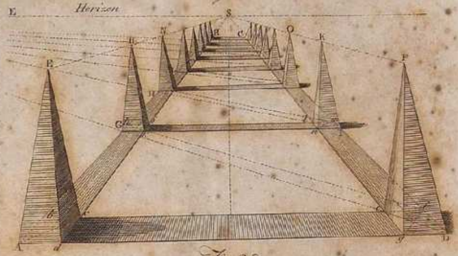
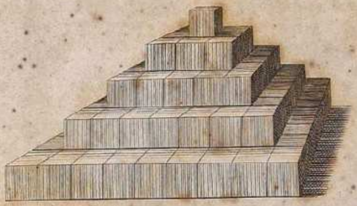


Fig. 27.



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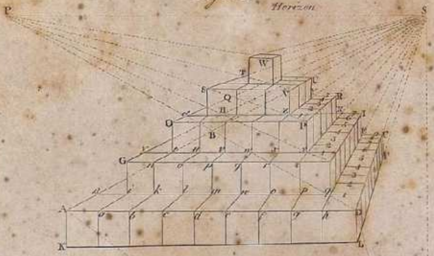

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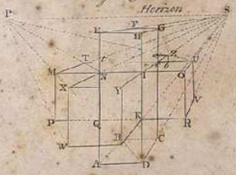


Fig. 30.

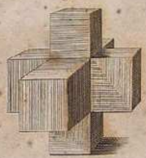
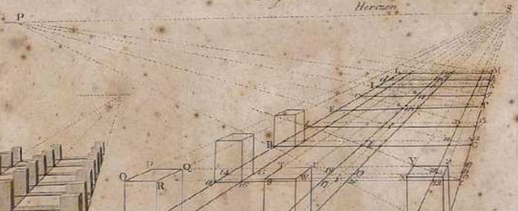


Fig. 32.



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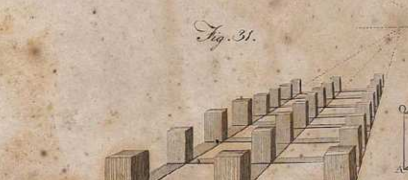


W. Archibald sculpt.

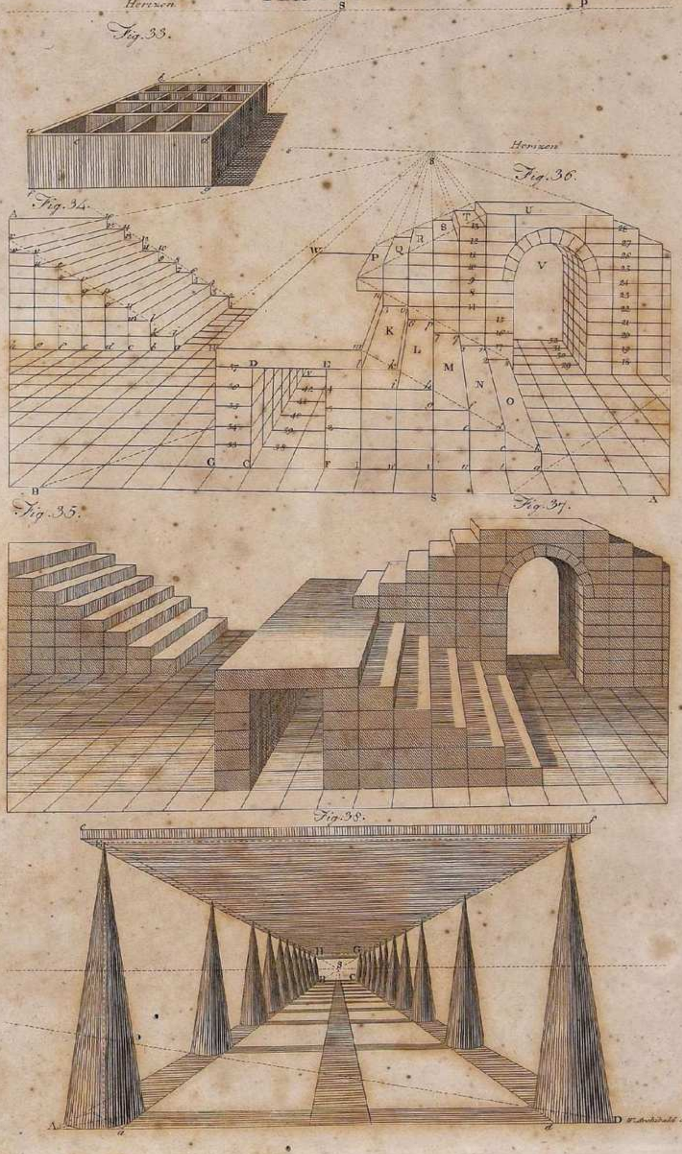
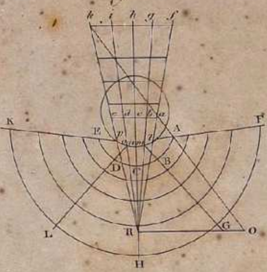

Horizon
Fig. 33.
Horizon
Fig. 36.
Fig. 34.
Fig. 35.
Fig. 37.
Fig. 38.

Fig. 39.



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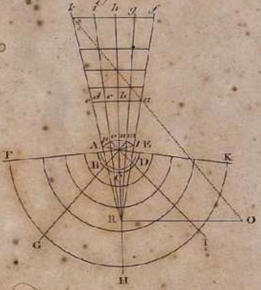

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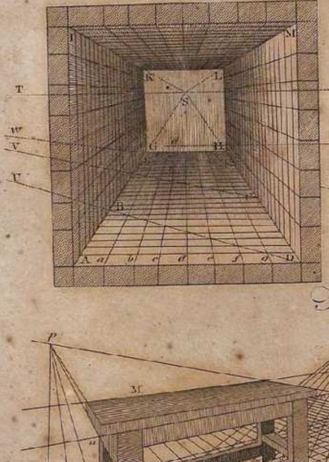


Fig. 42.

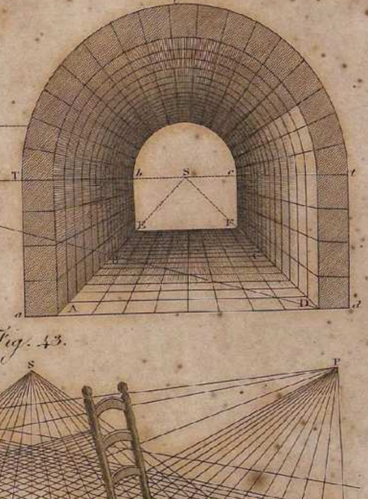
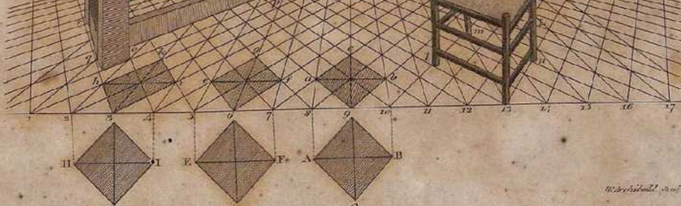


Fig. 43.



W. Archibald Sculpt.

Fig. 44.

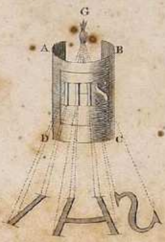
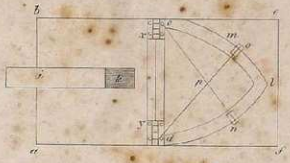


Fig. 45.



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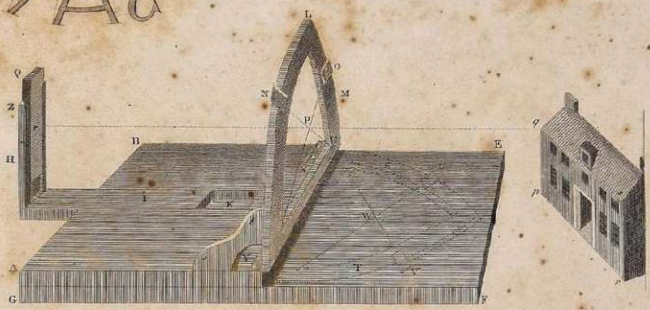

Fig. 47.

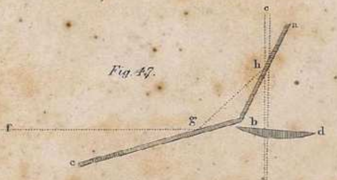

Fig. 48.

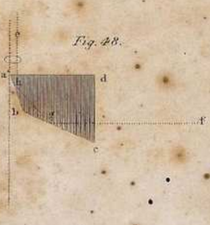

Fig. 49.

E. Mitchell sculp.

part to a flat board, half the length of the board *a b e f* (ABEF), and glued to its uppermost side. The centre of the arch *c m l* is at *d*, and the centre of the arch *d n l* is at *c*.

On the outer side of the arch *d n l* is a sliding piece *n* (much like the nut of the quadrant of altitude belonging to a common globe), which may be moved to any part of the arch between *d* and *l*: and there is such another slider *o* on the arch *c m l*, which may be set to any part between *c* and *l*.—A thread *c p n* (CPN) is stretched tight from the centre *c* (C) to the slider *n* (N), and such another thread is stretched from the centre *d* (D) to the slider *o* (O); the ends of the thread being fastened to these centres and sliders.

Now it is plain, that, by moving these sliders on their respective arches, the intersection *p* (P) of the threads may be brought to any point of the open space within the arches.—In the groove *k* (K) is a straight sliding bar *i* (I), which may be drawn further out, or pushed further in at pleasure.

To the outer end of this bar I (fig. 46.) is fixed the upright piece HZ, in which is a groove for receiving the sliding piece Q. In this slider is a small hole *r* for the eye to look through, in using the machine; and there is a long slit in HZ, to let the hole *r* be seen through when the eye is placed behind it, at any height of the hole above the level of the bar I.

How to delineate the perspective figure of any distant object or objects, by means of this machine.

Suppose you wanted to delineate a perspective representation of the house *q s r p* (which we must imagine to be a great way off, without the limits of the plate), place the machine on a steady table, with the end EF of the horizontal board ABEF, toward the house, so that when the Gothic-like arch DLC is set upright, the middle part of the open space (about P) within it may be even with the house when you place your eye at Z and look at the house through the small hole *r*. Then fix the corners of a square piece of paper with four wafers on the surface of that half of the horizontal board which is nearest the house; and all is ready for drawing.

Set the arch upright, as in the figure; which it will be when it comes to the perpendicular side *t* of the upright piece *s t* fixed to the horizontal board behind D. Then place your eye at Z, and look through the hole *r* at any point of the house, as *q*, and move the sliders N and O till you bring the intersection of the threads at P directly between your eye and the point *q*: then put down the arch flat upon the paper on the board, as at ST, and the intersection of the threads will be at W. Mark the point W on the paper with the dot of a black lead pencil, and set the arch upright again as before: then look through the hole *r*, and move the sliders N and O till the intersection of the threads come between your eye and any other point of the house, as *p*: then put down the arch again to the paper, and make a pencil mark thereon at the intersection of the threads, and draw a line from that mark to the former one at W; which line will be a true perspective representation of the corner *p q* of the house.

Proceed in the same manner, by bringing the intersection of the threads successively between your eye and other points of the outlines of the house, as *r*, *s*, &c. and put down the arch to mark the like points on the paper, at the intersection of the threads: then connect these points by straight lines, which will be the perspective outlines of the house. In like manner find points for the corners of the door and windows, top of the house, chimneys, &c. and draw the finishing lines from point to point: then shade the whole, making the lights and shades as you see them on the house itself, and you will have a true perspective figure of it.—Great care must be taken, during the whole time, that the position of the machine be not shifted on the table; and to prevent such an inconvenience, the table should be very strong and steady, and the machine fixed to it either by screws or clamps.

In the same way, a landscape, or any number of objects within the field of view through the arch, may be delineated, by finding a sufficient number of perspective points on the paper, and connecting them by straight or curved lines as they appear to the eye. And as this makes every thing in perspective equally easy, without taking the trouble to learn any of the rules for drawing, the operations must be very pleasing and agreeable. Yet as science is still more so, we would by all means recommend it to our readers to learn the rules for drawing particular objects; and to draw landscapes by the eye, for which, we believe, no perspective rules can be given. And although any thing may be very truly drawn in perspective by means of this machine, it cannot be said that there is the least degree of science in going *that* way to work.

The arch ought to be at least a foot wide at bottom, that the eye at Z may have a large field of view through it: and the eye should then be, at least, 10½ inches from the intersection of the threads at P when the arch is set upright. For if it be nearer, the boundaries of view at the sides near the foot of the arch will subtend an angle at Z of more than 60 degrees, which will not only strain the eye, but will also cause the outermost parts of the drawing to have a disagreeable appearance.—To avoid this, it will be proper to draw back the sliding bar I, till Z be 14½ inches distant from P; and then the whole field of view, through the foot wide arch, will not subtend an angle to the eye at Z of more than 45 degrees; which will give a more easy and pleasant view, not only of all the objects themselves, but also of their representations on the paper whereon they are delineated. So that whatever the width of the arch be, the distance of the eye from it should be in this proportion: as 12 is to the width of the arch, so is 14½ the distance of the eye (at Z) from it.

If a pane of glass, laid over with gum water, be fixed into the arch, and set upright when dry, a person who looks through the hole *r* may delineate the objects upon the glass which he sees at a distance through and beyond it, and then transfer the delineation to a paper put upon the glass, as mentioned in the beginning of the article PERSPECTIVE.

Mr Peacock likewise invented three simple instruments for drawing architecture and machinery in perspective, of which the reader will find sketches and descriptions in the 75th volume of the Philosophical Transactions. These descriptions are not inserted here, because we do not think the instruments superior to that described by Ferguson, and because we wish that our readers who have occasion to *draw* may make themselves so much masters of the art of perspective, as to be above the

Perspective.

the aid of such mechanical contrivances. But for the sake of those whose opportunities of improvement in the art do not enable them to practise it without such helps, we annex the following description of an instrument invented for this purpose by Dr Wollaston, and to which he has given the name of *Camera Lucida*.

"Having a short time since (says the author) amused myself with attempts to sketch various interesting views, without an adequate knowledge of the art of drawing, my mind was naturally employed in facilitating the means of transferring to paper the apparent relative positions of the objects before me; and I am in hopes that the instrument, which I contrived for this purpose, may be acceptable even to those who have attained to greater proficiency in the art, on account of the many advantages it possesses over the camera obscura.

"The principles on which it is constructed will probably be most distinctly explained by tracing the successive steps, by which I proceeded in its formation.

"While I look directly down at a sheet of paper on my table, if I hold between my eye and the paper a piece of plain glass, inclined from me downwards at an angle of 45°, I see by reflection the view that is before me, in the same direction that I see my paper through the glass. I might then take a sketch of it; but the position of the objects would be reversed.

"To obtain a direct view, it is necessary to have two reflections. The transparent glass must for this purpose be inclined to the perpendicular line of sight only the half of 45°, that it may reflect the view a second time from a piece of looking-glass placed beneath it, and inclined upwards at an equal angle. The objects now appear as if seen through the paper in the same place as before; but they are direct instead of being inverted, and they may be discerned in this manner sufficiently well for determining the principal positions.

"The pencil, however, and any object, which it is to trace, cannot both be seen distinctly in the same state of the eye, on account of the difference of their distances; and the efforts of successive adaption of the eye to one or to the other would become painful if frequently repeated. In order to remedy this inconvenience, the paper and pencil may be viewed through a convex lens of such a focus, as to require no more effort than is necessary for seeing the distant objects distinctly. These will then appear to correspond with the paper in *distance* as well as *direction*, and may be drawn with facility, and with any desired degree of precision.

"This arrangement of glasses will be best understood from inspecting fig. 47. *a b* in the transparent glass; *b c* the lower reflector; *b d* a convex lens (of 12 inches focus); *e* the position of the eye; and *f g h e* the course of the rays.

"In some cases a different construction will be preferable. Those eyes, which without assistance are adapted to seeing near objects alone, will not admit the use of a convex glass; but will on the contrary require one that is concave to be placed in front, to render the distant objects distinct. The frame for a glass of this construction is represented at *i k*, (fig. 49.) turning upon the same hinge at *h* with a convex glass in the frame I *m*, and moving in such a manner, that either of the glasses may be turned alone into its place, as may be necessary to suit an eye that is long or short sighted. Those persons, however, whose sight is nearly perfect, may at pleasure use either of the glasses.

"The instrument represented in that figure differs moreover in other respects from the foregoing, which I have chosen to describe first, because the action of the reflectors there employed would be more generally understood. But those who are conversant with the science of optics will perceive the advantage that may be derived in this instance from prismatic reflection; for when a ray of light has entered a solid piece of glass, and falls from within upon any surface, at an inclination of only twenty-two or twenty-three degrees, as above supposed, the refractive power of the glass is such as to suffer none of that light to pass out, and the surface becomes in this case the most brilliant reflector that can be employed.

"Fig. 48. represents the section of a solid prismatic piece of glass, within which both the reflections requisite are effected at the surfaces *a b*, *b c*, in such a manner that the ray *f g*, after being reflected first at *g*, and again at *h*, arrives at the eye in a direction *h e* at right angles to *f g*.

"There is another circumstance in this construction necessary to be attended to, and which remains to be explained. Where the reflection was produced by a piece of plain glass, it is obvious that any objects behind the glass (if sufficiently illuminated) might be seen through the glass as well as the reflected image. But when the prismatic reflector is employed, since no light can be transmitted directly through it, the eye must be so placed that only a part of its pupil may be intercepted by the edge of the prism, as at *e*, fig. 48. The distant objects will then be seen by this portion of the eye, while the paper and pencil are seen past the edge of the prism by the remainder of the pupil.

"In order to avoid inconvenience that might arise from unintentional motion of the eye, the relative quantities of light to be received from the object, and from the paper, are regulated by a small hole in a piece of brass, which by moving on a centre at *c*, fig. 49. is capable of adjustment to every inequality of light that is likely to occur.

"Since the size of the whole instrument, from being so near the eye, does not require to be large, I have on many accounts preferred the smallest size that could be executed with correctness, and have had it constructed on such a scale, that the lenses are only three-fourths of an inch in diameter.

"Though the original design, and principal use of this instrument is to facilitate the delineation of objects in true perspective, yet this is by no means the sole purpose to which it is adapted; for the same arrangement of reflectors may be employed with equal advantage for copying what has been already drawn, and may thus assist a learner in acquiring at least a correct outline of any subject.

"For this purpose the drawing to be copied should be placed as nearly as may be at the same distance before the instrument that the paper is beneath the eye-hole, for in that case the size will be the same, and no lens will be necessary either to the object, or to the pencil.

"By a proper use of the same instrument, every purpose of the pentagraph may also be answered; as a painting may be reduced in any proportion required, by placing

Perspective ‖ Perth.

cing it at a distance in due proportion greater than that of the paper from the instrument. In this case a lens becomes requisite for enabling the eye to see at two unequal distances with equal distinctness, and in order that one lens may suit for all these purposes, there is an advantage in carrying the height of the stand according to the proportion in which the reduction is to be effected.

"The principles on which the height of the stem is adjusted will be readily understood by those who are accustomed to optical considerations. For as in taking a perspective view the rays from the paper are rendered *parallel*, by placing a lens at the distance of its *principal* focus from the paper, because the rays received from the distant objects are *parallel*; so also when the object seen by reflection is at so short a distance that the rays received from it are in a certain degree *divergent*, the rays from the paper should be made to have the same degree of divergency in order that the paper may be seen distinctly by the same eye; and for this purpose the lens must be placed at a distance less than its principal focus. The stem of the instrument is accordingly marked at certain distances to which the conjugate foci are in the several proportions of 2, 3, 4, &c. to 1, so that distinct vision may be obtained in all cases, by placing the painting proportionally more distant.

"By transposing the convex lens to the front of the instrument and reversing the proportional distances, the artist might also enlarge his smaller sketches with every desirable degree of correctness, and the naturalist might delineate minute objects in any degree magnified."

PERSPECTIVE *Glass*, or *Graphical Perspective*. See DIOPTRICS.

PERSPIRATION, in *Physiology*, the excretion of a fluid through the pores of the skin. Perspiration is distinguished into sensible and insensible; and here sensible perspiration is the same with sweating, and insensible perspiration that which escapes the notice of the senses.

PERSPICUITY, properly signifies the property which any thing has of being easily seen through; hence it is generally applied to such writings or discourses as are easily understood.

PERSPICUITY, in composition. See ORATORY, N° 43.

PERTH, a county of Scotland, including Menteith, Braidalbin, Athol, Stratherne, part of Gowrie, and Perth Proper; is bounded by Badenoch and Lochaber on the north and north-west; by Marr on the north-east; by Argyle and Lennox on the west and south-west; having Clackmannanshire, part of Stirlingshire, and the Forth to the south; the shires of Kinross and Fife to the south-east, and Angus to the east. It extends above 70 miles in length, and near 60 at its greatest breadth, exhibiting a variety of Highlands and Lowlands; mountains, hills, dales, and straths, diversified with pasture grounds, corn fields, and meadows; rivers, lakes, forests, woods, plantations, inclosures, towns, villages, and a great number of elegant seats, beautifully situated, belonging to noblemen and gentlemen. The chief rivers of Perthshire are the Tay, the Teith, and the Erne, besides a great number of subordinate streams. The river Tay is famous for its salmon-fishery. The river Erne rises from Loch Erne, a lake seven miles long, in the mountainous country of Stratherne: this river, after a course of 34 miles from west to east, during which it receives many streams and rivulets, falls into the Tay at Abernethy.

"The Tay (says a late traveller), on the southern bank of which the city of Perth stands, is truly a noble river. It rises in Braidalbin, on the frontiers of Lorne. Before it has advanced many miles from its source, its stream is considerably augmented by the accession of several small rills. Soon after, it diffuses its waters into a small lake called Loch Dochart; and indeed the river itself there bears rather the name of the Dochart. Continuing its course from Loch Dochart, it soon again expands into another lake. Out of this it proceeds to Killin, still bearing, if I remember right, the name of the Dochart. Here it meets with another river which flows hither by a more north-easterly course. The waters are diffused into the famous Loch Tay, 16 miles in length. Issuing from this spacious lake at Kenmore, the Tay is soon after increased by the accession of the Lyon. It proceeds onward in an eastern direction through Athol, receiving as it advances all the waters in the country, till at Logierait it is joined by the large river of Tummel. Here it bends to the south, and advancing about eight miles reaches Dunkeld; whence taking a more northern direction, it continues its course towards Perth; being as it advances still augmented by the accession of various tributary streams, the most considerable of which is the Almond. At Perth it turns to the south-east, and receiving as it proceeds the waters of the Erne, passes by Abernethy, once the capital of the Pictish kingdom. Soon after this, it expands itself to the breadth of three miles. Contracting its breadth, as it approaches Dundee, it there opens into the German ocean. *Heron's Tour*, 1792.

"Such is the noble river; on the southern bank of which, where it has increased into a vast body of water, and not a great many miles above where it discharges itself into the ocean, Perth is advantageously situated. A person acquainted with the general character of great rivers, and with their influence in determining the aspect and the fertility of the districts through which they pass, might readily, without farther knowledge of the local circumstances than what is conveyed in this account of the course of the Tay, and of the situation of Perth upon it, conclude the city to stand amid delightful scenery, and to enjoy most of the advantages which natural circumstances afford, for the promotion of trade and industry."

Freestone, lead, iron, and copper ores, with some lapis calaminaris, are found in different parts of Perthshire. The soil, being generally rich and well manured, produces excellent wheat, and all kinds of grain. The hilly country abounds with pasture for the black cattle, horses, sheep, goats, and deer. The heaths, woods, and forests, are stored with variety of game; the rivers teem with salmon and trout; the gardens and orchards are stored with all kinds of herbs, roots, apples, pears, cherries, plums, and almost every species of fruit found in South Britain. The houses and attire, even of the commonalty, are neat and decent; and every peasant can produce a good quantity of linen, and great store of blankets, made in his own family. Indeed, this is the case through all the Lowlands of Scotland. Flax is reared by every husbandman; and being dressed at home, is spun by the females of his family into thread for linen; this is woven by country weavers, of whom there is a great number through all the low country, and afterwards

Perth. wards bleached or whitened by the good-wife and her fervants; fo that the whole is made fit for ufe at a very fmall expence. They likewife wafh, card, fpin, and weave their wool into tartan for plaids, kerfies, and coarfe ruffet-cloth, for common wearing, befides great part of it which is knit into caps, ftockings, and mitts. Plaids, made of the fineft worfted, are worn either plain or variegated, as veils, by women of the lower, and even of the middle rank; nay fome years ago, ladies of fafhion wore filken plaids with an undrefs: this is a loofe piece of drapery, gathered about the head, fhoulders, and waift, on which it is croffed, fo as to leave the hands at liberty, and produces a very good effect to the eye of the fpectator. The Lowlanders of Perthfhire are civilized, hofpitable, and induftrious: the commerce of the country confifts chiefly in corn, linen, and black cattle: there are, moreover, fome merchants who trade to foreign countries.—For an account of the different divifions of this county above mentioned, fee the articles as they occur in the order of the alphabet.

The population of this county in 1801 amounted to 126,366 (A).

The following table fhows the ftate of the population, according to its parifhes at two different periods.

	Parifhes.	Population in 1755.	Population in 1790—1798.
1	Aberdalgy	320	523
	Aberfoil	895	790
	Abernethy	1490	1415
	Abernyte	258	345
5	Alyth	2680	2723
	Arngafk	736	554
	Auchterarder	1194	1670
	Auchtergaven	1677	1784
	Balquhidder	1592	1300
10	Blackford	1681	1360
	Blair Athol	3257	3120
	Blairgowrie	1596	1651
	Bendothy	1293	878
	Callander	1750	2100
15	Caputh	2048	2045
	Cargill	1897	1720
	Clunie	905	1037
	Collace	499	473
	Comrie	2546	3000
20	Crieff	1414	2640
	Culrofs	1695	1442
	Cupar	1491	2076
	Dron	598	450
	Dull	5748	4676
25	Dumbarnie	764	1250
	Dumblane	2728	2750
	Dunkeld	1298	1773
	Dunkeld, Little	2919	2705
	Dunning	1491	1600
30	Errol	2229	2685
	Forgandenny	1295	978
	Fortevoit	1164	970
	Fortingal	3859	3914
	Foffaway	1765	15[illegible]5
35	Foulis, Wefter	1706	1224
	Foulis, Eafter	586	648
	Gafk	385	486
	Glendovan	220	240
	Inchture	893	1000
40	Kenmore	3067	3463
	Killin	1968	2360
	Kilmadock	2730	3209
	Kilfpindie	828	718
	Kincardine	1250	2068
45	Kinclaven	993	1150
	Kinfauns	639	628
	Kinloch	331	372
	Kinnaird	557	404
	Kinnoul	1163	1465
50	Kirkmichael	2689	2200
	Lecropt	577	420
	Lethendy	346	367
	Logie	1985	1500
	Logierait	2487	2200
55	Longforgan	1285	1526
	Maderty	796	631
	Meigle	1285	1148
	Methven	1790	1786
	Monedie	1492	1320
60	Monivaird	1460	1025
	Monzie	1192	1136
	Moulin	2109	1749
	Muckhart	535	526
	Muthil	2902	2948
65	Perth	9019	19,871
	Port	1865	1765
	Rattray	751	500
	Redgorton	1074	2123
	Rhind	498	495
70	St Madoes	189	300
	St Martins	1083	1090
	Scone	889	1442
	Tippermuir	988	1280
	Trinity Gafk	913	795
75	Tulliallan	1321	2430
76	Weem	1295	1364
		118,903	133,274
			118,903
		Increafe,	14,371

PERTH Proper, ftretching 20 miles in length, and at fome places 15 in breadth, is bounded on the north-eaft, by the Carfe of Gowrie; on the eaft, by Angus; on the weft, by Stratherne; on the north, by Athol; and on the fouth, by the frith of Tay. This is likewife a fruitful country, populous and well cultivated, abounding with gentlemen who poffefs opulent eftates; with farmers who underftand agriculture; and with manufacturers who turn their induftry to great account. North-eaftward from Perth to Brechin lies the vale of Strathmore, one of the moft fertile diftricts in Scotland, which gives the title of *Earl* to the noble family of Lyon.

PERTH,

(A) It is fuppofed that there is fome error in the ftatement of the population in 1801, by which it appears to be lefs than in 1790 and 1798. But by the return of the population of the town of Perth, the amount in 1801 is only 14,878; and in 1791 it was nearly 20,000, which will account for the difference.

Perth.

PERTH, the capital of the county of that name, is an agreeable, populous town, situated 20 miles within land, on the south bank of the river Tay. It was otherwise called *St Johnston's*, from a church dedicated to St John, as the patron of the place. It is a royal borough, second in dignity to the metropolis, the seat of a large presbytery, and gave the title of *Earl* to the family of Drummond, which is now forfeited. James Drummond, 4th earl, was created duke of Perth by James II. for adhering to whose interests he was outlawed. His two grandsons were attainted in 1745. No less than 14 national councils have been held at Perth between 1201 and 1459. But the oldest was at Scone, A. D. 906. Perth, in the reign of Edward I. of England, was possessed by the English, who secured it with fortifications: but after an obstinate resistance, they were expelled by Robert Bruce. In the year 1715, the rebels made it a place of arms, and retired to it, after the battle of Dumblane; but they were in a little time dislodged by the duke of Argyle, and retreated northwards with the pretender. They possessed it also in 1745. The pretender was proclaimed king, new magistrates were appointed, and an attempt was made to fortify it. The town is populous and handsome; the streets are well paved, and tolerably clean at all times; and the houses, though not stately, make a very decent appearance. Both the streets and houses are, for the greater part, disposed in a regularity of plan, which proves them not to be of the most remote antiquity. It is indeed true that the level situation, being singularly favourable to regularity, might, even from the first, give this an advantage over many of our old boroughs. Several streets run in a direction parallel with the river, as far as a right line can bear this relation to a curve line, nearly between east and west: these are again intersected by others extending between north and south. It should seem that anciently particular streets were inhabited, each by a particular class of artisans. The names still preserved seem to indicate as much. The shop-keepers or merchants occupied one street; the hammermen a second; and other crafts occupied, in the same manner, each a separate street. Many of the houses in that street called the *Water-gate*, seem to be very old buildings. Towards the south end of the Water-gate stands the famous palace of the Gowrie family. The house, and the very room, where the attempt of the Gowries to seize or assassinate the king was supposed to have been made, is now converted into barracks for a train of artillery; but the back-stair, down which the Ruthvens were thrown, is pulled down. This strange event, however magnified or attested by contemporary writers, is made up of so many improbabilities, or circumstances for which no reason can be assigned, that Sir David Dalrymple, in republishing the account printed by authority, 1600, preparatory to his further observations on it, seems justified in absolutely discrediting a fact which passed for problematical with so many persons at the very time. Dr Robertson supposes it a plot of Elizabeth to get James into her power. Mr Cant having discussed the whole story of the conspiracy in his Muse's Threnodie, p. 185—261, concludes, "that as this would have been a very impolitic measure, the best way of accounting for it is by James's known hatred to the Puritans, and wish to get rid of two popular characters." The king had been seized and forced from his favourites by the father of the Ruthvens 12 years before (1582), and though he affected to forgive him, took the first opportunity to condemn and execute him as a traitor, 1584. Mr Camden was too good a courtier to speak with impartiality of any part of this weak monarch's conduct. Though the name of *Gowrie* was abolished, the title of *Ruthven* was revived in the person of Sir Thomas Ruthven of Freeland, whom Charles II. 1651, created Lord Ruthven: but the honour, on the death of his son David in 1704, devolved on Isabel, surviving daughter of his second sister, who married Sir Francis Ruthven, and was succeeded, 1732, by his son James.

Heron's Tour.

Gough's Camden.

The castle of Perth stood near the red bridge, which terminated the narrow street called *Skinner-gate*. At the end of the Castle street another narrow street leads west to the Black-friars, called *Couvre feu-row*, where the curfeu bell was. The kings of Scotland before James II. were crowned at Scone, and resided at Perth as the metropolis of the nation. James resided and was educated in the castle of Edinburgh, and was crowned there 1437. The parliaments and courts of justice were removed from Perth to Edinburgh, but Perth kept its priority till 22 James III. 1482.

The church in which John Knox harangued is still standing, and is now divided into three; named the *east*, the *middle*, and the *west* kirks. The east kirk was lately very handsomely modernised within. There is an old hospital, a considerable building, the founding of which is ascribed to James VI. The town-house shuts up the eastern end of the High-street. A monastery of Carthusians was here established by King James I. of Scotland, who lost his life on the very spot, by the treachery of Athol and his accomplices. The king was buried in a very stately monument in this place, which was called *monasterium vallis virtutis*, one of the most magnificent buildings in the kingdom, which with the rest was destroyed by the populace. James VI. created George Hay commendator of the Carthusian priory, giving him all its emoluments, with a vote and seat in parliament; but these not being sufficient to support the title, he surrendered it back to the king. The only remains of this magnificent structure is to be seen in the carved stones with which the south-east porch of St John's church is built, now greatly decayed. The king's garment full of stabs was preserved here after the reformation.

The town was anciently provided with a stone bridge over the river, which an inundation swept away; but a new and very fine one has lately been built, the most beautiful structure of the kind in North Britain, and was designed and executed by Mr Smeaton. Its length is 900 feet; the breadth (the only blemish) 22 within the parapets. The piers are founded 10 feet beneath the bed of the river, upon oaken and beechen piles, and the stones laid in puzzolano, and cramped with iron. There are nine arches, of which the centre is 75 feet in diameter. This noble work opens a communication with all the different great roads of the kingdom, and was completed at the expence of 26,000l. Of this the commissioners of forfeited estates, by his majesty's permission, gave 11,000l.; Perth 2000l.; private subscribers 4756l.; the royal boroughs 500l. But still this great work would have met with a check for want of money, had not the earl of Kinnoul, with his characteristic public spirit, advanced the remaining sum, and taken the security

Perth, Pertinax.

curity of the tolls, with the hazard only to himſelf. The whole expence has now been defrayed, and the toll has ceaſed.

This town has but one pariſh, which has two churches, beſides meetings for ſeparatiſts, who are very numerous. One church, which belonged to a monaſtery, is very ancient: not a veſtige of the laſt is now to be ſeen; for the diſciples of Knox made a general deſolation of every edifice that had given ſhelter to the worſhippers of the church of Rome: it being one of his maxims, to pull down the neſts, and then the rooks would fly away.

The flouriſhing ſtate of Perth is owing to two accidents: the firſt, that of numbers of Cromwell's wounded officers and ſoldiers chooſing to reſide here, after he left the kingdom, who introduced a ſpirit of induſtry among the people; the other cauſe was the long continuance of the earl of Marr's army here in 1715, which occaſioned vaſt ſums of money being ſpent in the place. But this town, as well as all Scotland, dates its proſperity from the year 1745; the government of this part of Great Britain having never been ſettled till a little after that time.

That this town does not owe its origin to William I. 1210, as Boethius ſays, is evident from its being mentioned as a conſiderable place in the foundation charter of Holyroodhouſe by David I. 1128.

The population of Perth in 1791 is ſaid to have been nearly 20,000: but it is ſuppoſed that it has ſince increaſed to 22,000.

The trade of Perth is conſiderable. It exports annually 150,000l. worth of linen, from 24,000 to 30,000 bolls of wheat and barley to London and Edinburgh, and a very large quantity of cured ſalmon. That fiſh is taken there in vaſt abundance; 3000 having been caught in one morning; weighing, one with another, 16 pounds; the whole capture 48,000 pounds. The fiſhery begins on St Andrew's day, and ends Auguſt 26th old ſtyle. The rents of the fiſheries amount to conſiderably upwards of 3000l. per annum. Smelts come up this river in May and June. W. Long. 3. 27. N. Lat. 56. 22.

PERTH Amboy. See *New JERSEY.*

PERTINAX, was an illuſtrious Roman emperor after the death of Commodus. He was deſcended of a mean family; and like his father, who was either a ſlave or the ſon of a manumitted ſlave, he for ſome time followed the employment of drying wood and making charcoal. His poverty did not, however, prevent him from receiving a liberal education. For ſome time he was employed in teaching a number of pupils the Greek and the Roman languages in Etruria. He left this laborious profeſſion and became a ſoldier, and by his valour and intrepidity gradually roſe to offices of the higheſt truſt in the army, and was made conſul by M. Aurelius for his ſervices. He was afterwards entruſted with the government of Mœſia, and at length he preſided over the city of Rome as governor. When Commodus was murdered, Pertinax was univerſally choſen to ſucceed to the imperial dignity; and his refuſal, on the plea of old age and increaſing infirmities, did not prevent his being ſaluted emperor and Auguſtus. He complied with reluctance; but his mildneſs, his economy, and popularity, convinced the ſenate and the people of the prudence and the juſtice of their choice. He forbade his name to be inſcribed on ſuch places or eſtates as were part of the imperial domains, and aſſerted that they belonged not to him but to the public. He melted all the ſilver ſtatues which had been raiſed to his predeceſſor, and he expoſed to ſale all his concubines, horſes, arms, and all the inſtruments of his pleaſure and extravagance. With the money raiſed from theſe relics he enriched the empire, and was enabled to aboliſh all the taxes which Commodus had laid on the rivers, ports, and highways, through the empire. Theſe patriotic actions gained him the affection of the wortheiſt and moſt diſcerning of his ſubjects; but the extravagant, luxurious, and vicious, raiſed their clamours againſt him; and when the emperor attempted to introduce among the prætorian guards ſuch diſcipline as was abſolutely neceſſary to preſerve the peace and tranquillity of Rome, the flames of rebellion were kindled, and the minds of the ſoldiers totally alienated. Pertinax was apprized of their mutinying, but he refuſed to fly at the hour of danger. He ſcorned the advice of ſuch of his friends as wiſhed him to withdraw from the impending ſtorm; and he unexpectedly appeared before the ſeditious troops, and without fear or concern boldly aſked them, whether they who were bound by duty to defend the perſon of their prince and emperor, were come to betray him and to ſhed his blood? His undaunted courage and intrepidity would have had the deſired effect, and the ſoldiers had begun to retire, when one of the moſt ſeditious of them advanced and darted his javelin at the emperor's breaſt, exclaiming, *The ſoldiers ſend you this.* The reſt inſtantly followed the example; and Pertinax, muffling up his head, and calling upon Jupiter to avenge his death, remained unmoved, and was immediately diſpatched. His head was cut off and carried upon the point of a ſpear in triumph to the camp. This abominable murder happened in the 193d year of the Chriſtian era.

It was no ſooner known that Pertinax had been murdered, than the enraged populace flocked from all quarters of the city; and uttering dreadful menaces againſt the authors of his death, ran up and down the ſtreets in queſt of them. The ſenators were no leſs concerned for his death than the people; the more, becauſe they were now convinced, that the ſoldiers would ſuffer none to reign but tyrants. However, as they had more to loſe than the common people, they did not offer to revenge his death; but either ſhut themſelves up in their own houſes, or in thoſe of the ſoldiers of their acquaintance, thinking themſelves there more ſafe. Such was the unfortunate and much-lamented end of Publius Helvius Pertinax, after he had lived 66 years 7 months and 26 or 28 days; and reigned, according to Dio Caſſius, 87 days, that is, from the 1ſt of January to the 28th of March. His body, together with his head, was interred with great pomp by Didius Julianus, his ſucceſſor, in the burying place of his wife's family. The emperor Septimius Severus, with the title of emperor, aſſumed the name of Pertinax, which he knew would above any thing elſe recommend him to the army in Illyricum, and to the Roman people. He puniſhed with great ſeverity all thoſe who had been acceſſory to his death, diſbanded the prætorian guards, honoured his memory with a moſt magnificent funeral, at which was carried the effigies of the deceaſed prince, pronounced his panegyric, and cauſed him to be ranked in the number of the gods, appointing the ſon chief prieſt to his father. The day of his acceſſion to the empire was yearly celebrated with

Pertinax || Peru. with the Circensian games; and his birthday, for many years after, with other sports. He performed great things, says Herodian, during his short administration, and would have restored the empire to its former lustre, had he been indulged with a longer reign.

PERTINENT of Lands, in *Scots Law*. See Law, N° clxvii. 6. p. 670.

PERU, a country of South America, is bounded on the north by Popayan, on the east by Amazonia, on the south by Chili, and on the west by the Pacific ocean; extending from 1° 40′ north to 26° 10′ south latitude, and between 56° and 81° west longitude from Greenwich; being about 1800 miles in length, but its greatest breadth does not much exceed 390.

1 How discovered by the Spaniards. This country was discovered by the Spaniards; and the first intelligence they had of it was on the following occasion. Nunez de Balboa having been raised to the government of the small colony at Santa Maria in Darien by the suffrages of his companions, was very desirous of having that authority confirmed by the court of Spain. For this purpose he endeavoured to recommend himself to the Spanish ministry by some important service; that is, by extorting from the Indians as much gold and silver as he could. He therefore made frequent inroads into the adjacent country, subdued several of the caciques or petty princes, and collected a considerable quantity of gold. In one of these expeditions, the Spaniards contended so violently about the division of some gold which they had taken, that they were on the point of coming to blows with one another. A young cacique who was present, astonished at such contention about a thing of which he knew not the use, tumbled the gold out of the balance with indignation, and turning to the Spaniards, told them, that since they valued gold so very highly, he would conduct them to a country where the most common utensils were made of that metal. The Spaniards eagerly catched at this hint; and upon further questioning the cacique, were informed, that at the distance of six days journey, towards the south, from the place where they were at that time, they should discover another ocean, near which this desirable country was situated; but if they intended to attack that powerful state, they must assemble a much greater number of forces than had hitherto appeared on the continent.

Balboa was transported at the news. He immediately concluded, that the ocean mentioned by the cacique was that which Columbus had so long sought for in vain, and that the rich territory described to him must be part of the East Indies. He was therefore impatient till he should arrive at that happy country, in comparison with the discovery of which all former exploits almost vanished into nothing. In order therefore to procure a force sufficient to ensure success in his enterprise, he first secured the friendship of the neighbouring caciques, and then dispatched some of his officers to Hispaniola, with a large quantity of gold as a proof of his past success, and an earnest of what he expected. By this means he secured the friendship of the governor, and procured a considerable reinforcement. But though he now imagined himself sufficiently strong to attempt the discovery, there were still prodigious difficulties to be surmounted.

2 Difficulties they had to overcome. The isthmus of Darien, though not above 60 miles in breadth, has a chain of lofty mountains running through its whole extent. Being situated between two vast oceans, the Atlantic and Pacific, the climate is excessively moist, insomuch that it rains for two-thirds of the year. In consequence of this the valleys are marshy, and so frequently overflowed, that the inhabitants find it necessary in some places to build their houses upon trees, in order to be elevated at some distance from the damp soil, and the odious reptiles engendered in the waters. There are also many large rivers very difficult to be crossed; and as the country at that time was only inhabited by a few wandering savages, the enterprise of Balboa was looked upon as the most difficult that had been undertaken by any Spanish adventurer.

On this arduous task Balboa set out on the 1st day of September 1513, about the time that the periodical rains began to abate. He had only 190 Spaniards along with him; but all of them were hardy veterans, inured to the climate of America, and very much attached to their leader. A thousand Indians attended in order to carry their provisions and other necessaries; and they had along with them some of those fierce dogs so terrible to the natives of America.

Balboa proceeded by sea, and without difficulty, to the territories of a cacique whose friendship he had gained; but as soon as he began to advance into the interior parts of the country, he met with all the difficulties above mentioned. Some of the caciques also, at his approach, fled with all their people to the mountains, carrying off or destroying whatever could afford subsistence to an army. Others collected their force in order to oppose him: however, Balboa continued unmoved in spite of all difficulties, and at last, after a most painful journey of 25 days, he arrived at the South sea; when, with the most extravagant transports of joy, he went into it up to the middle, and took possession of the ocean in his master's name, vowing to defend it against all the enemies of Spain. 3 Balboa first gets a sight of the South sea.

That part of the South sea which Balboa now discovered, he called the *Gulf of St Michael;* which name it still retains, and is situated to the east of Panama. From some of the neighbouring caciques he extorted provisions and gold by force; others sent him presents voluntarily; and he had the satisfaction to hear, that the adjacent coasts abounded with pearl-oysters. The inhabitants were also unanimous in declaring, that there was to the southward a very rich and populous country, where the people had tame animals, which they endeavoured to describe to him, meaning the Peruvian sheep. But, however impatient he might be to visit this empire, he considered it as highly improper to venture thither with a handful of men exhausted by labour and disease. He therefore led back his followers to Santa Maria, in order to refresh them after their fatigues; and from thence he sent an account to the court of Spain of the important discovery he had made, demanding a reinforcement of 1000 men, in order to conquer the country he had newly discovered. But here his hopes were all blasted at once. The king indeed determined to prosecute the discovery, but refused to continue Balboa in his government, appointing Pedrarias Davila to supersede him, and giving him the command of 15 stout vessels, with 1200 soldiers, to ensure his success. 4 He is deprived of his command.

Balboa, though much mortified by his disgrace, submitted to the king's pleasure without repining. It was not long, however, before he met with an additional

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tional misfortune; the new governor tried him for ſome pretended irregularities committed before his arrival, and fined him of almoſt all he was worth. In the mean time the Spaniards, paying no regard to the treaties concluded by Balboa with the Indians, plundered and deſtroyed all indiſcriminately, inſomuch that the whole country, from the gulf of Darien to the lake Nicaragua, was deſolated. The new comers had alſo arrived at the moſt unlucky time of the year, namely, about the middle of the wet ſeaſon, when the exceſſive rains produced the moſt violent and fatal diſeaſes. To this was joined an extreme ſcarcity of proviſions; ſo that in the ſpace of a month above 600 Spaniards periſhed in the utmoſt miſery.

Balboa failed not to ſend violent remonſtrances to Spain againſt the conduct of the new governor; and he, on the other hand, accuſed his antagoniſt of having deceived the king by falſe accounts of the country, and magnifying his own exploits beyond meaſure. At laſt the king, ſenſible of his error in ſuperſeding Balboa, appointed him adelantado, or lieutenant-governor of the countries on the South ſea, with very extenſive privileges and authority; enjoining Pedrarias to ſupport him in all his enterpriſes, and to conſult with him in every thing which he himſelf undertook. It was impoſſible, however, to extinguiſh the envy of Pedrarias; and therefore, though a reconciliation took place in appearance, even ſo far, that Pedrarias agreed to give his daughter in marriage to Balboa, yet he

5 And put to death.

ſoon after had him condemned and executed on pretence of diſloyalty, and an intention to revolt from the king.

On the death of Balboa, the thoughts of conquering Peru were for a time laid aſide; however, it ſtill remained an object of deſire to all the Spaniſh adventurers in America. Accordingly, ſeveral armaments were fitted out with a deſign to explore and take poſſeſſion of the countries to the eaſt of Panama; but, either through the difficulties which attended the undertaking itſelf, or the bad conduct of the adventurers, all of them proved unſucceſsful, until at laſt it became a general opinion, that Balboa's ſcheme had been entirely viſionary.

6 A new expedition ſet on foot.

Still, however, there were three perſons ſettled at Panama, on whom the common opinions made ſo little impreſſion, that they determined to go in queſt of this country, looked upon to be chimerical by the generality of their neighbours. Their names were *Franciſco Pizarro*, *Diego de Almagro*, and *Hernando Luque*. Pizarro and Almagro were ſoldiers of fortune, and Luque was an eccleſiaſtic, who acted both as prieſt and ſchoolmaſter at Panama. Their confederacy was authoriſed by Pedrarias governor of Panama; and each engaged to employ his whole fortune in the adventure. Pizarro, being the leaſt wealthy of the three, engaged to take upon himſelf the greateſt ſhare of the fatigue and danger, and to command in perſon the armament which was to go firſt upon the diſcovery. Almagro offered to conduct the ſupplies of proviſions and reinforcements of troops which might be neceſſary; and Luque was to remain at Panama, in order to negociate with the governor, and to ſuperintend whatever was carrying on for the general intereſt.

7 Meets with bad ſucceſs at firſt.

In 1524 Pizarro ſet ſail from Panama with a ſingle veſſel of ſmall burthen and 112 men; and ſo little was he or his countrymen at that time acquainted with the climate of America, that the moſt improper ſeaſon of the whole year was choſen for his departure: the periodical winds, which were then ſet in, being directly oppoſite to the courſe which he propoſed to ſteer. The conſequence of this was, that, after beating about for 70 days with much danger and fatigue, he had advanced ſcarce as far to the ſouth-eaſt as a ſkilful navigator will now make in three days. He touched at ſeveral places of Terra Firma; but finding that country exceedingly inhoſpitable and unhealthy, he was obliged to retire to Chuchama, oppoſite to the Pearl iſlands, where he hoped to receive ſome reinforcements from Panama. Here he was found by Almagro, who had ſet out in queſt of him with a reinforcement of 70 men, and had ſuffered diſtreſſes very much reſembling thoſe of Pizarro himſelf. In particular, he had loſt an eye in combat with the Indians. However, he had advanced as far as the river of St Juan in the province of Popayan, where the country ſhowing a better aſpect, and the inhabitants more friendly, our projectors again began to indulge themſelves in hopes, and determined by no means to abandon their ſcheme.

Almagro returned to Panama, in hopes of recruiting their ſhattered troops. But the bad accounts of the ſervice gave his countrymen ſuch an unfavourable idea of it, that Almagro could levy no more than 80 men, and theſe with great difficulty. Slender as this reinforcement was, however, the adventurers did not heſitate at renewing their enterpriſe. The diſaſters and diſappointments they met with in this new attempt, were ſcarcely inferior to thoſe they had already experienced, when part of the armament at laſt reached the bay of St Matthew on the coaſt of Quito, and landed at Tacamez to the ſouth of the river of Emeralds, where they met with a more fertile and champaign country than any they had yet ſeen; the natives alſo were more civilized, and clothed in garments of cotton or woollen ſtuff, adorned with trinkets of gold and ſilver. But notwithſtanding theſe favourable appearances, Pizarro did not think fit to attack ſuch a powerful empire with a handful of ſoldiers already exhauſted; and therefore retired to a ſmall iſland called Gallo, with part of the troops; from whence he diſpatched Almagro to Panama, in hopes of obtaining a reinforcement.

The reception which Almagro met with was by no means agreeable. Some of the adventurers had informed their friends of the many dangers and loſſes which they had ſuſtained; which not only diſheartened people from engaging in the ſervice, but weighed ſo much with Pedro de los Rios, the ſucceſſor of Pedrarias, that he prohibited the raiſing of new recruits, and even diſpatched a veſſel to bring home Pizarro and his companions from the iſland of Gallo. Almagro and Luque, though much mortified with this diſappointment, privately adviſed Pizarro not to relinquiſh an enterpriſe on which they had built all their hopes. He therefore poſitively refuſed to obey the orders of the governor, and employed all his addreſs in perſuading his men not to abandon him. But the calamities to which they had been expoſed had ſuch an effect upon them, that when he drew a line upon the ſand with his ſword, telling ſuch as wiſhed to return that they might paſs over it, only 13 had reſolution to remain with him.

8 Pizarro abandoned by all his men but thirteen.

Pizarro

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Pizarro with his little troop now fixed their refidence on the ifle of Gorgona, which they confidered as a fafer retreat than Gallo, as being farther removed from the coaft, and uninhabited, fo that they might with the greater fecurity wait for fupplies. Here they continued five months in the moft unwholefome climate imaginable, and at laft had come to a refolution of committing themfelves to fea on a float, when a veffel arrived from Panama to their relief. This was the effect of the continued folicitations of Almagro and Luque; who, though they could not prevail upon the governor to favour the undertaking, had fucceeded fo far as to induce him to fend a fmall veffel to the relief of Pizarro and his unfortunate affociates. However, the more effectually to fhow his difapprobation of Pizarro's fcheme, the governor refufed to allow one landman to go on board of the fhip which he fent.—The hopes of the adventurers were now again revived, and Pizarro eafily induced them to re-

9
Goes on with his fcheme at all adventures.

fume their fcheme. Inftead of returning to Panama, therefore, they failed to the fouth eaft, and in 20 days after the difcovery of Gorgona, they difcovered the coaft of Peru. Having touched at fome places of lefs note, they at length arrived at Tumbez, remarkable for its ftately temple, and a palace of the incas or fovereigns of the country. Here they found that what had been told them concerning the riches of the country was true; not only ornaments and facred veffels being made of gold and filver, but even fuch as were for common ufe. Yet to attempt the conqueft of this opulent empire with their flender force, would have been madnefs; they contented themfelves therefore with viewing it, procuring two of the beafts of burthen called *llamas*, to which they gave the name of fheep, fome veffels of gold and filver, and two young men, whom they propofed to inftruct in the Caftilian language. With thefe Pizarro arrived at Panama in the year 1527, near three years after he had fet out from that place on his expedition.

10
Hiftory of the Incas of Peru.

The empire of Peru, thus difcovered, is faid to have been originally poffeffed by independent tribes, juftly reckoned among the moft favage even in America; living more like wild beafts than men. For feveral ages they lived in this manner, when fuddenly there appeared on the banks of a lake called *Titiaca*, a man and woman of majeftic form, and clothed in decent garments. They declared themfelves to be the children of the fun, fent by their beneficent parent to inftruct and reclaim mankind.

The names of thefe two extraordinary perfonages were *Manco Capac* and *Mama Ocla*. At their perfuafion, feveral of the difperfed favages united, and, receiving their commands as heavenly injunctions, followed them to Cuzco, where they fettled, and began to lay the foundations of a city. Manco Capac inftructed the men in agriculture, and other ufeful arts; while Mama Ocla taught the women to fpin and weave; after which Manco turned his attention towards the introduction of proper laws and regulations into his new ftate.

Thus, according to the Indian tradition, was founded the empire of the Incas, or lords of Peru. At firft its extent was fmall, the territory of Manco Capac reaching not above eight leagues from Cuzco his capital. Within thefe narrow limits, however, he exercifed the moft perfect defpotifm, and the fame was maintained by his fucceffors, all of whom were not only obeyed as monarchs, but reverenced as deities. Their blood was held to be facred, and, by prohibiting intermarriages with the people, was never contaminated by mixing with that of any other race. The family, thus feparated from the reft of the nation, was diftinguifhed by peculiarities in drefs and ornaments, which it was unlawful for others to affume. Among the Peruvians, however, it is faid, that this high degree of veneration was made ufe of by the monarchs only to promote the good of their fubjects. If we may believe the accounts given by their countrymen, the Peruvian monarchs extended their empire not with a view to increafe their own power and wealth, but from a defire of diffufing the bleffings of civilization, and the knowledge of the arts which they poffeffed, among the barbarous people whom they reduced, and, during a fucceffion of 12 monarchs, not one deviated from this character.

The Peruvians were taught by Manco to adore the Creator of heaven and earth, whom they denominated *Paca Camac*, that intelligence which animated the world. They feldom built temples or offered facrifices to him, but worfhipped him in their hearts. One temple, however, dedicated to *The unknown God*, the Spaniards found at their arrival, erected in a valley, thence named *the valley of Paca Camac*. The facrifices inftituted in honour of the fun confifted chiefly of lambs; befides which they offered all forts of cattle, fowls, and corn, and even burnt their fineft cloths on the altar by way of incenfe. They had alfo drink offerings made of maize or Indian corn, fteeped in water. Nor were thofe oblations the only acts of adoration in general ufe among them. When they firft drank after their meals, they dipped the tip of their finger into the cup, and lifting up their eyes with great devotion, gave the fun thanks for their liquor, before they prefumed to take a draught of it.

Carver's Modern General Traveller.

11
Religion of the Peruvians.

Befides the worfhip of the fun, they paid fome kind of veneration to the images of feveral animals and vegetables that had a place in their temples. Thefe were generally the images brought from the conquered nations, where the people worfhipped all forts of creatures, animate or inanimate; it being the cuftom, when a province was fubdued, to remove all their idols to the temple of the fun at Cuzco.

Exclufive of the folemnities at every full moon, four grand feftivals were celebrated annually. The firft of thofe, called *Raymi*, was held in the month of June, immediately after the fummer folftice, and was kept not only in honour of the fun, but of their firft Inca, Manco Capac, and Coya Mama Ocla, his wife and fifter, whom the Incas confidered as their firft parents, defcended immediately from the fun, and fent by him into the world to reform and polifh mankind. At this feftival, all the viceroys, generals, governors, and nobility, were affembled at the capital city of Cuzco; and the emperor, or Inca, officiated in perfon as high-prieft; though on other occafions the facerdotal function was difcharged by the regular pontiff, who was ufually either the uncle or brother of the Inca.

The morning of the feftival being come, the Inca, accompanied by his near relations, drawn up in order according to their feniority, went barefoot in proceffion, at break of day, to the market-place, where they re-

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mained looking attentively towards the eaſt in expectation of the riſing ſun. The luminary no ſooner appeared, than they fell proſtrate on their faces in the moſt profound veneration, and univerſally acknowledged it to be their god and father.

The vaſſal princes, and nobility, that were not of the blood royal, aſſembled in another ſquare, and performed the like ceremony. Out of a large flock of ſheep the prieſts then choſe a black lamb, which they offered in ſacrifice, firſt turning its head towards the eaſt. From the entrails of the victim, on this occaſion, they ſuperſtitiouſly drew prognoſtics relating to peace and war, and other public events.

That the Peruvians believed in the immortality of the ſoul, appears from the practice of the Incas, who conſtantly inculcated to the people, that, on leaving this world, they ſhould enter into a ſtate of happineſs provided for them by their god and father the ſun.

12 They were acquainted with aſtronomy before the arrival of the Spaniards.

Before the arrival of the Spaniards in America, the Peruvians were acquainted with ſome points of aſtronomy. They had obſerved the various motions of the planet Venus, and the different phaſes of the moon. The common people divided the year only by the ſeaſons; but the Incas, who had diſcovered the annual revolution of the ſun, marked out the ſummer and winter ſolſtices by high towers, which they erected on the eaſt and weſt of the city of Cuzco. When the ſun came to riſe directly oppoſite to four of thoſe towers, on the eaſt ſide of the city, and to ſet againſt thoſe of the weſt, it was then the ſummer ſolſtice; and in like manner, when it roſe and ſet againſt the other towers, it was the winter ſolſtice. They had alſo erected marble pillars in the great court before the temple of the ſun, by which they obſerved the equinoxes. This obſervation was made under the equator, when the ſun being directly vertical, the pillars caſt no ſhade. At thoſe times they crowned the pillars with garlands of flowers and odoriferous herbs, and celebrating a feſtival, offered to their adored luminary rich preſents of gold and precious ſtones.

They diſtinguiſhed the months by the moon, and their weeks were called quarters of the moon; but the days of the week they marked only by the ordinal numbers, as firſt, ſecond, &c. They were aſtoniſhed at the eclipſes of the ſun and moon. When the former hid his face, they concluded it was on account of their ſins, imagining that this phenomenon portended famine, war, and peſtilence, or ſome other terrible calamity. In a ſimilar ſtate of the moon, they apprehended that ſhe was ſick, and when totally obſcured, that ſhe was dying. At this alarming criſis they ſounded their trumpets, and endeavoured by every kind of noiſe to rouſe the lunar planet from her ſuppoſed lethargy; teaching their children to cry out, and call upon *mama quilla*, or "mother moon," that ſhe would not die and leave them to periſh.

They made no predictions from any of the ſtars, but conſidered dreams, and the entrails of beaſts which they offered in ſacrifice, as inſtructive objects of divination. When they ſaw the ſun ſet, they imagined that he plunged into the ocean, to appear next morning in the eaſt.

13 They had teachers of morality;

Among a people wholly void of letters, the ſpeculative eſſays of the underſtanding muſt have been very rude and imperfect. They had, however, among them amentas, or philoſophers, who delivered moral precepts, and likewiſe cultivated poetry. Comedies and tragedies compoſed by thoſe bards were acted on their feſtivals before the king and the royal family, the performers being the great men of the court, and the principal officers of the army. The amentas alſo compoſed ſongs and ballads; but if we may judge from the rudeneſs of the muſic with which they are ſaid to have been accompanied, they were far from being agreeable to a poliſhed ear.

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14 and were not unacquainted with painting and ſtatuary.

That the Peruvians were not unacquainted with painting and ſtatuary, appears from the furniture and ornaments of their temples and palaces; but in all the implements of mechanic arts they were extremely deficient. Though many goldſmiths were conſtantly employed, they had never invented an anvil of any metal, but in its ſtead made uſe of a hard ſtone. They beat their plate with round pieces of copper in place of hammers; neither had they any files or graving tools. Inſtead of bellows for melting their metals, they uſed copper pipes, of a yard long, almoſt of the form of a trumpet. Having no tongs to take their heated metal out of the fire, they made uſe of a ſtick or copper bar. Their carpenters had no other tools than hatchets made of copper or flint; nor had they learned the uſe of iron; though the country affords mines of that metal. Inſtead of nails, they faſtened their timber with cords or the tough twigs of trees. A thorn, or a ſmall bone, ſerved them for a needle; and inſtead of thread, the ſinews of animals, or the fibres of ſome plant. Their knives were made of flint or copper.

15 Progreſs of the Spaniards facilitated by a civil war among the natives;

When the Spaniards firſt viſited this country, they found it agitated by a civil war. Huana Capac, the 12th monarch from the founder of the ſtate, was ſeated on the throne; who is repreſented as a prince no leſs conſpicuous for his abilities in war than for his pacific virtues. By him the kingdom of Quito was ſubdued, which almoſt doubled the extent of the dominions and power of the Peruvian empire. Notwithſtanding the ancient and fundamental law againſt polluting the blood of the Inca with any foreign alliance, Huana married the daughter of the conquered monarch, by whom he had a ſon named *Atahualpa*, commonly written *Atabalipa*, to whom, at his death in 1529, he left the kingdom of Quito, beſtowing the reſt of his dominions upon Huaſcar his eldeſt ſon by a mother of the royal race. This produced a civil war, in which Atabalipa proved victorious, and afterwards attempted to ſecure himſelf on the throne by putting to death all the deſcendants of Manco Capac, ſtyled *the children of the ſun*, whom he could ſeize either by force or ſtratagem; however, from a political motive, he ſpared the life of his rival Huaſcar, who had the misfortune to be taken priſoner in an engagement, that, by iſſuing out orders in his name, he might more eaſily eſtabliſh his own authority, and cover the illegality of his birth.

This conteſt had ſo much engaged the attention of the Peruvians, that they never once attempted to check the progreſs of the Spaniards. It was ſome time, however, before Pizarro was informed of this conteſt, ſo much in his favour. The firſt intelligence which he received of it was a meſſage from Huaſcar, aſking his aſſiſtance againſt Atabalipa, whom he repreſented as a rebel and an uſurper. Pizarro perceived the importance of the intelligence, and therefore determined

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to push forward, while intestine discord put it out of the power of the Peruvians to attack him with their whole force. Being obliged to divide his troops, in order to leave a garrison in St Michael, which might serve for a place of retreat in case of a disaster, he began his march with only 62 horsemen and 102 foot-soldiers, 20 of whom were armed with cross-bows, and only three with muskets. He directed his course towards Caxamalca, a small town at the distance of 12 days march from St Michael, where Atabalipa was encamped with a considerable body of troops. Before he had proceeded far, an officer dispatched by the Inca met him with a valuable present from that prince, accompanied with a proffer of his alliance, and his assurances of a friendly reception at Caxamalca. Pizarro, according to the usual artifice of his countrymen in America, pretended to come as the ambassador of a powerful monarch, and declared that he was now advancing with intention to offer Atabalipa his aid against those enemies who disputed his title to the throne.

16 and by their ignorance of the motives of the Spaniards.

As the object of the Spaniards in entering their country was altogether incomprehensible to the Peruvians, they had formed various conjectures concerning it, without being able to decide whether they should consider their new guests as beings of a superior nature, who had visited them from some beneficent motive, or as formidable avengers of their crimes, and enemies to their repose and liberty. The continual professions of the Spaniards, that they came to enlighten them with the knowledge of truth, and lead them in a way of happiness, favoured the former opinion; the outrages which they committed, their rapaciousness and cruelty, were awful confirmations of the latter. While in this state of uncertainty, Pizarro's declaration of his pacific intentions so far removed all the Inca's fears, that he determined to give him a friendly reception. In consequence of this resolution, the Spaniards were allowed to march in tranquillity across the sandy desert between St Michael and Motupè, where the most feeble effort of an enemy, added to the unavoidable distresses which they suffered in passing through that comfortless region, must have proved fatal to them. From Motupè they advanced towards the mountains which encompass the low country of Peru, and passed through a defile so narrow and inaccessible, that a few men might have defended it against a numerous army. But here likewise, from the same inconsiderate credulity of the Inca, the Spaniards met with no opposition, and took quiet possession of a fort erected for the security of that important station. As they now approached near to Caxamalca, Atabalipa renewed his professions of friendship; and, as an evidence of his sincerity, sent them presents of greater value than the former.

On entering Caxamalca, Pizarro took possession of a large court, on one side of which was a house which the Spanish historians call a palace of the Inca, and on the other a temple of the sun, the whole surrounded with a strong rampart or wall of earth. When he had posted his troops in this advantageous station, he dispatched Hernando Soto, and his brother Ferdinand, to the camp of Atabalipa, which was about a league distant from the town. He instructed them to confirm the declaration which he had formerly made of his pacific disposition, and to desire an interview with the Inca, that he might explain more fully the intention of the Spaniards in visiting his country. They were treated with all the respectful hospitality usual among the Peruvians in the reception of their most cordial friends, and Atabalipa promised to visit the Spanish commander next day in his quarters. The decent deportment of the Peruvian monarch, the order of his court, and the reverence with which his subjects approached his person and obeyed his commands, astonished those Spaniards, who had never met in America with any thing more dignified than the petty cacique of a barbarous tribe. But their eyes were still more powerfully attracted by the vast profusion of wealth which they observed in the Inca's camp. The rich ornaments worn by him and his attendants, the vessels of gold and silver in which the repast offered to them was served up, the multitude of utensils of every kind formed of those precious metals, opened prospects far exceeding any idea of opulence that a European of the 16th century could form.

On their return to Caxamalca, while their minds were yet warm with admiration and desire of the wealth which they had beheld, they gave such a description of it to their countrymen, as confirmed Pizarro in a resolution which he had already taken. From his own observation of American manners during his long service in the New World, as well as from the advantages which Cortes had derived from seizing Montezuma, he knew of what consequence it was to have the Inca in his power. For this purpose, he formed a plan as daring as it was perfidious. Notwithstanding the character he had assumed of an ambassador from a powerful monarch, who courted an alliance with the Inca, and in violation of the repeated offers which he had made to him of his own friendship and assistance, he determined to avail himself of the unsuspicious simplicity with which Atabalipa relied on his professions, and to seize his person during the interview to which he had invited him. He prepared for the execution of his scheme with the same deliberate arrangement, and with as little compunction, as if it had reflected no disgrace on himself or his country. He divided his cavalry into three small squadrons, under the command of his brothers Ferdinand, Soto, and Benalcazar; his infantry was formed into one body, except 20 of most tried courage, whom he kept near his own person to support him in the dangerous service which he reserved for himself; the artillery, consisting of two field-pieces, and the cross-bow men, were placed opposite to the avenue by which Atabalipa was to approach. All were commanded to keep within the square, and not to move until the signal for action was given.

17 Perfidious scheme of Pizarro to seize the Inca.

Early in the morning the Peruvian camp was all in motion. But as Atabalipa was solicitous to appear with the greatest splendour and magnificence in his first interview with the strangers, the preparations for this were so tedious, that the day was far advanced before he began his march. Even then, lest the order of the procession should be deranged, he moved so slowly, that the Spaniards became impatient and apprehensive that some suspicion of their intention might be the cause of this delay. In order to remove this, Pizarro dispatched one of his officers with fresh assurances of his friendly disposition. At length the Inca approached. First of all appeared

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400 men in an uniform dreſs, as harbingers to clear the way before him. He himſelf, ſitting on a throne or couch, adorned with plumes of various colours, and almoſt covered with plates of gold and ſilver enriched with precious ſtones, was carried on the ſhoulders of his principal attendants. Behind him came ſome chief officers of his court carried in the ſame manner. Several bands of ſingers and dancers accompanied this cavalcade; and the whole plain was covered with troops, amounting to more than 30,000 men.

As the Inca drew near the Spaniſh quarters, Father Vincent Valverede, chaplain to the expedition, advanced with a crucifix in one hand, and a breviary in the other, and in a long diſcourſe explained to him the doctrine of the creation, the fall of Adam, the incarnation, the ſufferings and reſurrection of Jeſus Chriſt, the appointment of St Peter as God's vicegerent on earth, the tranſmiſſion of his apoſtolical power by ſucceſſion to the popes, the donation made to the king of Caſtile by Pope Alexander of all the regions in the New World. In conſequence of all this, he required Atabalipa to embrace the Chriſtian faith, to acknowledge the ſupreme juriſdiction of the pope, and to ſubmit to the king of Caſtile as his lawful ſovereign; promiſing, if he complied inſtantly with this requiſition, that the Caſtilian monarch would protect his dominions, and permit him to continue in the exerciſe of his royal authority; but if he ſhould impiouſly refuſe to obey his ſummons, he denounced war againſt him in his maſter's name, and threatened him with the moſt dreadful effects of his vengeance.

This ſtrange harangue, unfolding deep myſteries, and alluding to unknown facts, of which no power of eloquence could have conveyed at once a diſtinct idea to an American, was ſo lamely tranſlated by an unſkilful interpreter, little acquainted with the idiom of the Spaniſh tongue, and incapable of expreſſing himſelf with propriety in the language of the Inca, that its general tenor was altogether incomprehenſible to Atabalipa. Some parts in it, of more obvious meaning, filled him with aſtoniſhment and indignation. His reply, however, was temperate. He began with obſerving, that he was lord of the dominions over which he reigned by hereditary ſucceſſion; and added, that he could not conceive how a foreign prieſt ſhould pretend to diſpoſe of territories which did not belong to him; that if ſuch a prepoſterous grant had been made, he, who was the rightful poſſeſſor, refuſed to confirm it; that he had no inclination to renounce the religious inſtitutions eſtabliſhed by his anceſtors; nor would he forſake the ſervice of the ſun, the immortal divinity whom he and his people revered, in order to worſhip the God of the Spaniards, who was ſubject to death; that with reſpect to other matters contained in his diſcourſe, as he had never heard of them before, and did not now underſtand their meaning, he deſired to know where he had learned things ſo extraordinary. "In this book," anſwered Valverde, reaching out to him his breviary. The Inca opened it eagerly; and turning over the leaves, lifted it to his ear: "This (ſays he) is ſilent; it tells me nothing;" and threw it with diſdain to the ground. The enraged monk, running towards his countrymen, cried out, "To arms, Chriſtians, to arms; the word of God is inſulted; avenge this profanation on thoſe impious dogs."

Pizzaro, who during this long conference had with difficulty reſtrained his ſoldiers, eager to ſeize the rich ſpoils of which they had now ſo near a view, immediately gave the ſignal of aſſault. At once the martial muſic ſtruck up, the cannon and muſkets began to fire, the horſe ſallied out fiercely to the charge, the infantry ruſhed on ſword in hand. The Peruvians, aſtoniſhed at the ſuddeneſs of an attack which they did not expect, and diſmayed with the deſtructive effects of the fire-arms, and the irreſiſtible impreſſion of the cavalry, fled with univerſal conſternation on every ſide, without attempting either to annoy the enemy or to defend themſelves. Pizarro, at the head of his choſen band, advanced directly towards the Inca; and though his nobles crowded around him with officious zeal, and fell in numbers at his feet, while they vied one with another in ſacrificing their own lives, that they might cover the ſacred perſon of their ſovereign, the Spaniards ſoon penetrated to the royal ſeat: and Pizarro ſeizing the Inca by the arm, dragged him to the ground, and carried him as a priſoner to his quarters. The fate of the monarch increaſed the precipitate flight of his followers. The Spaniards purſued them towards every quarter, and, with deliberate and unrelenting barbarity, continued to ſlaughter wretched fugitives, who never once offered at reſiſtance. The carnage did not ceaſe until the cloſe of day. Above 4000 Peruvians were killed. Not a ſingle Spaniard fell, nor was one wounded but Pizarro himſelf, whoſe hand was ſlightly hurt by one of his own ſoldiers, while ſtruggling eagerly to lay hold on the Inca.

18 Atabalipa ſeized by Pizarro.

The plunder taken on this occaſion was immenſe, but the Spaniards were ſtill unſatisfied; which being obſerved by the Inca, he endeavoured to apply himſelf to their ruling paſſion, avarice, in order to obtain his liberty: and therefore offered ſuch a ranſom as aſtoniſhed them, even after all they knew concerning the opulence of the country. The apartment in which he was confined was 22 feet in length and 16 in breadth; and all this ſpace he engaged to fill with veſſels of gold as high as he could reach. This propoſal was eagerly caught by Pizarro, and a line was drawn upon the walls to mark the ſtipulated height.

19 He offers an immenſe ſum for his liberty.

Atabalipa, charmed with the thoughts of liberty, immediately ſet about performing his part of the agreement, and deſpatched meſſengers into all parts of the empire, in order to collect the immenſe quantity of gold which he had promiſed; and though the unfortunate monarch was now in the hands of his enemies, ſuch was the veneration which his ſubjects had for him, that his orders were obeyed with as great alacrity as though he had been at full liberty; while he, in the mean time, flattering himſelf with the hopes of being ſoon releaſed, made no preparations for expelling the invaders from his dominions.

In a ſhort time Pizarro received intelligence that Almagro was arrived at St Michael with a reinforcement equal to the force he had with him. This was a matter of great joy to the Spaniards, and no ſmall vexation to Atabalipa, who now conſidered his kingdom as in danger of being totally overrun by theſe ſtrangers, whoſe force he neither knew, nor the means they had of tranſporting themſelves. For this reaſon he determined to put his brother Huaſcar to death, leſt he ſhould join the ſtrangers againſt him. To this he was the rather inclined,

Peru. clined, as he had got information that the captive prince had been making applications to them, and had offered them a much larger ſum than what was ſtipulated for the Inca's ranſom; and in conſequence of this determination the unfortunate prince loſt his life.

In the mean time the Indians daily arrived at Caxamalca with vaſt quantities of treaſure; the ſight of which ſo much inflamed the Spaniards, that they inſiſted upon an immediate diviſion: and this being complied with, there fell to the ſhare of each horſeman 8000 peſos, at that time not inferior to the value of as many pounds ſterling in the preſent century, and half as much to each foot ſoldier, Pizarro and his officers receiving ſhares proportionable to their dignity. A fifth part was reſerved for the emperor, together with ſome veſſels of curious workmanſhip as a preſent. In conſequence of this immenſe acquiſition of wealth, many of the Spaniards became clamorous for their diſcharge; which was readily granted by their general, as well knowing that the diſplay of their riches would not fail to allure adventurers more hardy, though leſs opulent, to his ſtandard.

20 Pizarro reſolves to put the Inca to death.

After this diviſion of the ſpoil, Atabalipa was very importunate with Pizarro in order to recover his liberty; but the Spaniard, with unparalleled treachery and cruelty, had now determined to put him to death. To this he was urged by Almagro's ſoldiers, who, though they had received an equal ſhare with the reſt, were ſtill unſatisfied. The Inca's ranſom had not been completed; and they were apprehenſive, that whatever ſums might afterwards be brought in, the troops of Pizarro would appropriate them to themſelves as part of that ranſom. They inſiſted with Pizarro, therefore, to put him to death, that all the adventurers might for the future be on an equal footing. Accounts were likewiſe received that troops were aſſembling in the remote provinces of the empire, which Pizarro ſuſpected to be done by the Inca's orders. Theſe accounts were heightened by one Philipillo an Indian interpreter, who had conceived a paſſion for one of the unhappy monarch's wives; and for that reaſon wiſhed to have him put to death. Atabalipa himſelf, too, had the misfortune to haſten his own ruin by his conceiving a contemptuous notion of Pizarro, which he had not the precaution to conceal. He had, ſince they were firſt diſcovered by him, admired the European arts of reading and writing, and wiſhed much to know whether he ſhould regard it as a natural or acquired talent. In order to determine this, he deſired one of the ſoldiers who guarded him to write the name of God upon the nail of his thumb. This he ſhowed to ſeveral Spaniards ſucceſſively, aſking its meaning; and to his ſurpriſe, they all returned the ſame anſwer. At length Pizarro entered; and, on preſenting it to him, he bluſhed, and was obliged to own his ignorance; which inſpired the Inca with the contemptuous notion of him above mentioned.

21 Atabalipa accuſed and condemned,

In order, however, to give ſome ſhow of juſtice to ſuch a deteſtable action, and that be might he exempted from ſtanding ſingly as the perpetrator, Pizarro reſolved to accuſe the Inca of ſome capital crime, and inſtitute a court of judicature for the purpoſe of trying him. For this purpoſe, he appointed himſelf and Almagro, with two aſſiſtants, as judges, with full powers to acquit or condemn: an attorney-general was named to carry on the proſecution in the king's name; counſellors were choſen to aſſiſt the priſoner in his defence; and clerks were ordained to record the proceedings of court. Before this ſtrange tribunal a charge was exhibited ſtill more amazing. It conſiſted of various articles: that Atabalipa, though a baſtard, had diſpoſſeſſed the lawful owner of the throne, and uſurped the regal power; that he had put his brother and lawful ſovereign to death; that he was an idolater, and had not only permitted, but commanded the offering up of human ſacrifices; that he had a great number of concubines; that ſince his impriſonment, he had waſted and embezzled the royal treaſures, which now belonged of right to the conquerors; and that he had excited his ſubjects to take up arms againſt the Spaniards. On theſe heads of accuſation they proceeded to try the ſovereign of a great empire, over whom they had no juriſdiction. To all theſe charges the Inca pleaded not guilty. With reſpect to the death of his brother, he alleged, that the Spaniards could take no cognizance of the fact. With regard to the taxes which he had levied, and the wars he had carried on, they were nothing to the Spaniards; and as to the conſpiracy againſt the Spaniards, he utterly denied it. He called heaven and earth to witneſs the integrity of his conduct, and how faithfully he had performed his engagements, and the perfidy of his accuſers. He deſired to be ſent over to Spain to take his trial before the emperor; but no regard was paid to his intreaties. He was condemned to be burnt alive; which cruel 22 ſentence was mitigated, as a great favour, to ſtrang- and ſtrangling; and the unhappy monarch was executed without ed. mercy.

The death of the Inca was followed by a revolution in the Spaniſh affairs, who now became generally odious. Hideous cries were ſet up by his women as the funeral proceſſion paſſed by their apartment; many offered to bury themſelves alive with him; and on being hindered, 23 ſtrangled themſelves out of grief and vexation. The A general whole town of Caxamalca was filled with lamentation, revolt of which quickly extended itſelf over the whole kingdom. the Peruvians. Friends and enemies accuſed the Spaniards of inhumanity and treachery. Loads of gold that were coming to Caxamalca by order of the deceaſed Inca were now ſtopped; and the loſs of the treaſure was the firſt unfortunate conſequence which the Spaniards felt from their late iniquitous conduct. The two factions of Indians united againſt Pizarro; and many of the Spaniards not only exclaimed againſt the cruelty of the judges, but would even have mutinied, had not a ſenſe of the impending danger kept them quiet. At Cuzco the friends of the emperor Huaſcar proclaimed Manco Capac the legitimate brother of the late Inca, determining to ſupport him to the laſt againſt all the machinations of his enemies. Pizarro, in the mean time, ſet up Taparpa, the ſon of Atabalipa, cauſing him to be treated with all the honours due to an emperor. Immediately he ſet out for Cuzco, the gaining of which was abſolutely neceſſary for his deſign. An army of Indians occupied the paſſes, and reſolved to diſpute his progreſs. The conteſt, however, was ſoon decided; the Spaniſh cavalry bore down every thing before them, and great numbers of Indians were ſlain. The conquerors gained a conſiderable booty; and Pizarro diſpatched Almagro to reduce Cuzco, while he himſelf founded a new colony in the fruitful valley of Xauna; which, however, was not permanent, being

Peru. being afterwards removed to the place where Lima now ſtands.

While Pizarro was thus employed, another commander named *Ferdinando Soto*, was detached with 60 horſe to make the beſt of his way to Cuzco, and clear the road for the march of the remainder of the army. He was oppoſed by a formidable collection of Indians, who had fortified themſelves in order to defend a paſs againſt him: for which reaſon, fearing leſt his ſtrength might be unequal, he ſent a meſſage to Pizarro, deſiring that the Inca might join him, thinking that his preſence would awe the Peruvians, and prevent the further effuſion of blood; but his expectations were fruſtrated by the death of the Inca, which happened about this time; ſo that there was now a neceſſity for having recourſe to arms; for as the Spaniards ſet up no perſon in his room, the title of Manco Capac was univerſally acknowledged.

In the mean time, a new ſupply of ſoldiers arriving from Spain, Benalcazar, governor of St Michael, undertook an expedition againſt Quito, where, according to the report of the natives, Atabalipa had left the greateſt part of his treaſure. He accompliſhed his purpoſe with very great difficulty, having a country covered with rocks and mountains to paſs, and being oppoſed by large bodies of the natives. But when he got poſſeſſion of the city, to his extreme mortification, he found that the inhabitants had carried off all their gold and ſilver; for they being now acquainted with the ruling paſſion of the Spaniards, had taken care to diſappoint it, by removing the treaſures which they knew very well had been the cauſe of the expedition.

24 Chili invaded by Alvarado.

About the ſame time Alvarado governor of Guatimala, invaded the province of Chili. In this expedition his troops endured ſuch hardſhips, and ſuffered ſo much from the cold among the Andes, that a fifth part of the men and all the horſes died, and at the ſame time the reſt were ſo much diſpirited and emaciated, that they became quite unfit for ſervice. What was worſt of all, when they had arrived at the end of their journey, they met with a body of Spaniards drawn up in hoſtile array to oppoſe them. Theſe had been ſent againſt him by Pizarro, who claimed Chili as part of his juriſdiction, and were now joined by Benalcazar, with the troops under his command. Alvarado, however, advanced boldly to the attack; but on the interpoſition of ſome moderate men in each party, the difference was accommodated. Alvarado engaged to return to his government, upon his being paid 100,000 peſos to defray the expence of his armament. However, moſt of his followers remained in the country, and enliſted in the ſervice of Pizarro.

25 He is obliged by Pizarro to abandon the enterprize.

In the mean time Ferdinand Pizarro, the brother of the general, had landed in Spain, where he produced ſuch immenſe quantities of gold and ſilver as aſtoniſhed the court, even after all they had ſeen of the wealth of their new diſcovered territories. The general's authority was confirmed to him, with new powers and privileges, and the addition of 70 leagues extending along the coaſt, to the ſouthward of the territory granted in his former patent. Almagro had the title of *adelantado* or *governor* conferred upon him, with juriſdiction over 200 leagues of a country lying ſouthward from the province allotted to Pizarro; he himſelf was made a knight of the order of St Jago.

26 Honours conferred on Pizarro by the court of Spain.

Of theſe tranſactions ſome accounts were received at Peru before the arrival of Ferdinand Pizarro himſelf; and no ſooner did Almagro hear that he had obtained the royal grant of an independent government, than, pretending that Cuzco, the capital of all Peru, lay within his juriſdiction, he attempted to ſeize it. Pizarro was no leſs ready to oppoſe him; and a very dangerous civil war was about to take place, when the quarrel was made up, on condition that Almagro ſhould attempt the conqueſt of Chili; and if he did not find there an eſtabliſhment equivalent to his expectations, Pizarro ſhould yield up to him part of Peru.

By this reconciliation Pizarro was left at liberty to ſettle the internal policy of his province, which, though little qualified for a legiſlator, he attempted, by dividing the country into various diſtricts, appointing magiſtrates to preſide in each, and eſtabliſhing ſuch regulations concerning the adminiſtration of juſtice, the royal revenue, &c. as occurred to him. The ſeat of government he removed from Cuzco to Lima, which he named *Ceudad des los Reyes*, and which name it ſtill retains among the Spaniards in all legal and formal deeds. Its other name, *Lima*, is a corruption of *Rimac*, the name of the valley in which the city ſtands.

In the mean time Almagro had ſet out on his expedition to Chili; the event of which has been related under the article CHILI; and while he was thus employed, Pizarro encouraged ſome of his moſt diſtinguiſhed officers to invade thoſe provinces of the empire which had not yet been viſited by the Spaniards. This he did with a view to keep them employed, and prevent tumults; but it was attended with very terrible conſequences. No ſooner did Manco Capac the Inca perceive the ſecurity of the Spaniards in thus dividing their forces, than he ſeized the opportunity of making one vigorous effort to redreſs the wrongs of himſelf and his countrymen, and expel the invaders, who had tyrannized in ſuch a cruel manner. Though ſtrictly guarded by the Spaniards, he found means to communicate his intentions to the chief men of his nation, whom he joined in the year 1536, under pretence of celebrating a feſtival which he had obtained liberty from Pizarro to attend. Upon this the ſtandard of war was immediately erected, and a moſt formidable army, according to the Spaniſh hiſtorians, of 200,000 men collected. Many Spaniards were maſſacred in their habitations, and ſeveral detachments entirely cut off; and while this vaſt army laid ſiege to Cuzco, another formidable body inveſted Lima, and kept the governor cloſely ſhut up. The greateſt effort, however, was made againſt Cuzco, which was defended by Pizarro and his two brothers, with only 170 men. The ſiege laſted nine months; many of the Spaniards were killed; among whom was Juan Pizarro, the general's brother, and the beſt beloved of them all. The reſt were reduced to the moſt deſperate ſituation, when Almagro appeared ſuddenly in the neighbourhood of Cuzco. He had received ſuch accounts of the inſurrection in Peru, as would at any rate have determined him to return to the aſſiſtance of Pizarro; but beſides this, he had now received the royal patent,

27 A dreadful inſurrection of the Peruvians.

patent, creating him governor of Chili, and deemed it certain beyond all contradiction, that Cuzco lay within his juriſdiction; for which reaſon he haſtened to prevent it from falling into the hands of the Peruvians. On his arrival his aſſiſtance was ſolicited by both parties. The Inca made many advantageous propoſals; but at length deſpairing of obtaining any cordial union with a Spaniard, he attacked him in the night by ſurpriſe with a great body of choſen troops. But the Spaniſh valour and diſcipline prevailed againſt the numbers of their enemies; and the Peruvians were repulſed with ſuch ſlaughter, that a great part of the remainder diſperſed, and Almagro advanced to the gates of Cuzco without oppoſition. Pizarro's brothers took meaſures to oppoſe his entrance; but prudence for the preſent reſtrained both parties from entering into a civil war while they were ſurrounded with enemies; and therefore each leader endeavoured to corrupt the followers of his antagoniſt. In this Almagro had the advantage; and ſo many of Pizarro's troops deſerted in the night, that Almagro was encouraged to advance towards the city, where he ſurpriſed the centinels, and inveſting the houſe where the two brothers were lodged, he compelled them, after an obſtinate defence, to ſurrender at diſcretion; and Almagro's authority over Cuzco was immediately recognized as authentic.

28 They are defeated, and diſperſed.

29 Civil war between Pizarro and Almagro.

In this fray only two or three perſons were killed; but matters ſoon began to wear a more ſerious aſpect. Francis Pizarro, having diſperſed the Peruvians who inveſted Lima, and received conſiderable reinforcements from other provinces, ordered 500 men under the command of Alonſo de Alvarado to march to Cuzco, in hopes of relieving his brothers, if they were not already cut off. They advanced to a ſmall diſtance from the capital, before they knew that they had a more formidable enemy than the Indians to encounter. When they ſaw their countrymen drawn up on the banks of a river to oppoſe them, they were greatly ſurpriſed; however, Almagro, who wiſhed rather to gain them than to fight, began with attempting to ſeduce their leader. Alvarado could not by any means be gained over; but being inferior in military ſkill, Almagro attacked him by ſurpriſe, entirely defeated and diſperſed his army, taking himſelf and ſome of his principal officers priſoners.

This victory ſeemed deciſive; and Almagro was adviſed to make it ſo by putting to death Gonzalo and Ferdinand Pizarro, Alvarado, and ſome others whom he could not hope to gain. This advice, however, he declined from motives of humanity, and a deſire of making his adverſary appear the aggreſſor. For theſe reaſons, inſtead of marching directly againſt Pizarro, he retired quietly to Cuzco; which gave his adverſary time to recollect himſelf from the diſorder into which the news of ſo many diſaſters had thrown him. He began again to practiſe upon Almagro thoſe arts which had before proved ſucceſsful; and Almagro again ſuffered himſelf to be deceived by pretended offers of pacification. The negotiations for this purpoſe were protracted for ſeveral months; and while Almagro was employed in detecting and eluding the fraudulent intentions of the governor, Gonzalo Pizarro and Alvarado found means to corrupt the ſoldiers who guarded them, and not only made their own eſcape, but perſuaded 60 of Almagro's men to accompany them. There now remained only Ferdinand Pizarro in the hands of Almagro; and he was delivered by another act of treachery. The general propoſed that all points of controverſy ſhould be ſubmitted to the deciſion of their ſovereign: and that Ferdinand Pizarro ſhould be inſtantly ſet at liberty, and return to Spain, together with ſome officers whom the general propoſed to ſend over to ſhow the juſtice of his claims. Though the intention of Pizarro by making this propoſal was evident, Almagro was deceived by it, and releaſed thoſe whom Pizarro wanted; which he had no ſooner done, than the latter threw off all diſguiſe, and openly declared, that arms alone muſt now decide the matter between them. He therefore immediately ſet out for Cuzco with an army of 700 men, to which Almagro had only 500 to oppoſe. From the weakneſs of his forces, probably, Almagro did not attempt to guard ſome ſtrong paſſes, through which Pizarro had to march, but waited patiently for his adverſary in a plain open country.

In the mean time, Pizarro advanced without any obſtruction from his enemy; and an engagement ſoon happened, in which Almagro was defeated and taken priſoner. The conquerors behaved with great cruelty, maſſacring a great number of officers, and treating Almagro himſelf with great ſeverity. The Indians had aſſembled in great numbers to ſee the battle, with an intention to join the vanquiſhed party; but were ſo much overawed by the Spaniards, that they retired quietly after the battle was over, and thus loſt the only opportunity they ever had of expelling their tyrants.—Almagro, after having for ſome months languiſhed in priſon, was at length formally tried, and condemned to die by Pizarro. Notwithſtanding his conſummate bravery, for which he was remarkable, this hardy veteran could not bear the deliberate approach of death, but condeſcended to uſe intreaties to ſave his life. The Pizarros, however, continued inflexible; and he was firſt ſtrangled in priſon, and then publicly beheaded. He left one ſon by an Indian woman, whom he appointed his ſucceſſor, by virtue of a power granted him by the emperor.

30 Almagro defeated and taken priſoner,

31 and ſtrangled.

As during theſe diſſenſions all intercourſe with Spain ceaſed, it was ſome time before the accounts of the civil war were received at court. The firſt intelligence was given by ſome of Almagro's ſoldiers, who had left America on the ruin of their cauſe; and they did not fail to repreſent the injuſtice and violence of Pizarro in the ſtrongeſt colours, which ſtrongly prejudiced the emperor againſt him. In a ſhort time, however, Ferdinand Pizarro arrived, and endeavoured to give matters a new turn. The emperor was uncertain which of them he ought to believe; and therefore thought it neceſſary to ſend over ſome perſon with ample powers to inquire into the merits of the cauſe, and to determine certainly who was in the wrong. If he found the governor ſtill alive, he was to aſſume only the title of judge, in order to have the appearance of acting in concert with him; but if he was dead, the viceroy might then produce his commiſſion appointing him Pizarro's ſucceſſor in the government. This complaiſance to Pizarro, however, proceeded more from a dread of his power than from any other thing; for in the mean time, his brother Ferdinand was arreſted at Madrid, and confined

fined to a priſon where he remained above 20 years. The perſon nominated to this important truſt was Chriſtoval Vaca de Caſtro.

32 Peru divided by Pizarro among his aſſociates.

While this gentleman was preparing for his voyage, Pizarro, conſidering himſelf as the unrivalled maſter of Peru, proceeded to parcel out its territories among the conquerors; and had this diviſion been made with any degree of impartiality, the extent of country which he had to beſtow was ſufficient to have gratified his friends, and to have gained his enemies. But Pizarro conducted this tranſaction, not with the equity and candour of a judge attentive to diſcover and to reward merit, but with the illiberal ſpirit of a party-leader. Large diſtricts, in parts of the country moſt cultivated and populous, were ſet apart as his own property, or granted to his brothers, his adherents, and favourites. To others, lots leſs valuable and inviting were aſſigned. The followers of Almagro, amongſt whom were many of the original adventurers, to whoſe valour and perſeverance Pizarro was indebted for his ſucceſs, were totally excluded from any portion in thoſe lands, towards the acquiſition of which they had contributed ſo largely. As the vanity of every individual ſets an immoderate value upon his own ſervices, and the idea of each, concerning the recompenſe due to them, roſe gradually to a more exorbitant height in proportion as their conqueſts extended, all who were diſappointed in their expectations exclaimed loudly againſt the rapaciouſneſs and partiality of the governor. The partiſans of Almagro murmured in ſecret, and meditated revenge.

Rapid as the progreſs of the Spaniards in South America had been ſince Pizarro landed in Peru, their avidity of dominion was not yet ſatisfied. The officers to whom Ferdinand Pizarro gave the command of different detachments, penetrated into ſeveral new provinces; and though ſome of them were expoſed to great hardſhips in the cold and barren regions of the Andes, and others ſuffered diſtreſs not inferior amidſt the woods and marſhes of the plains, they made diſcoveries and conqueſts which extended their knowledge of the country, as well as added to their power. Pedro de Valdivia re-aſſumed Almagro's ſcheme of invading Chili; and, notwithſtanding the fortitude of the natives in defending their poſſeſſions, made ſuch progreſs in the conqueſt of the country, that he founded the city of St Jago, and gave a beginning to the eſtabliſhment of the Spaniſh dominion there. But of all the enterpriſes undertaken about this period, that of Gonzales Pizarro was the moſt remarkable.

33 Expedition of Gonzales Pizarro.

The governor, who ſeems to have reſolved that no perſon in Peru ſhould poſſeſs any ſtation of diſtinguiſhed eminence or authority but thoſe of his own family, had deprived Benalcazar, the conqueror of Quito, of his command in that kingdom, and appointed his brother Gonzales to take the government of it. He inſtructed him to attempt the diſcovery and conqueſt of the country to the eaſt of the Andes; which, according to the information of the Indians, abounded with cinnamon and other valuable ſpices. Gonzales, not inferior to any of his brothers in courage, and no leſs ambitious of acquiring diſtinction, eagerly engaged in this difficult ſervice. He ſet out from Quito at the head of 340 ſoldiers, near one half of whom were horſemen, with 4000 Indians to carry their proviſions. In forcing their way through the defiles, or over the ridges of the Andes, exceſs of cold and fatigue, to neither of which they were accuſtomed, proved fatal to the greater part of the wretched attendants. The Spaniards, though more robuſt, and inured to a variety of climates, ſuffered conſiderably, and loſt ſome men; but when they deſcended into the low country, their diſtreſs increaſed. During two months it rained inceſſantly, without any interval of fair weather long enough to dry their clothes. The vaſt plains upon which they were now entering, either altogether without inhabitants, or occupied by the rudeſt and leaſt induſtrious tribes in the New World, yielded little ſubſiſtence. They could not advance a ſtep but as they cut a road through woods, or made it through marſhes. Such inceſſant toil, and continual ſcarcity of food, ſeem more than ſufficient to have exhauſted and diſpirited any troops. But the fortitude and perſeverance of the Spaniards in the 16th century were inſuperable. Allured by frequent but falſe accounts of rich countries before them, they perſiſted in ſtruggling on, until they reached the banks of the Coca or Napo, one of the large rivers whoſe waters pour into the Maragnon, and contribute to its grandeur. There, with infinite labour, they built a bark, which they expected would prove of great utility, both in conveying them over rivers, in procuring proviſions, and in exploring the country. This was manned with 50 ſoldiers, under the command of Francis Orellana, the officer next in rank to Pizarro. The ſtream carried them down with ſuch rapidity, that they were ſoon far a-head of their countrymen, who followed ſlowly and with difficulty by land.

34 Orellana ſails down the river Maragnon, and deſerts Pizarro.

At this diſtance from his commander, Orellana, a young man of an aſpiring mind, began to fancy himſelf independent; and, tranſported with the predominant paſſion of the age, he formed the ſcheme of diſtinguiſhing himſelf as a diſcoverer, by following the courſe of the Maragnon until it joined the ocean, and by ſurveying the vaſt regions through which it flows. This ſcheme of Orellana's was as bold as it was treacherous. For, if he be chargeable with the guilt of having violated his duty to his commander, and with having abandoned his fellow-ſoldiers in a pathleſs deſert, where they had hardly any hopes of ſucceſs, or even of ſafety, but what were founded on the ſervice which they expected from the bark, his crime is, in ſome meaſure, balanced by the glory of having ventured upon a navigation of near 2000 leagues, through unknown nations, in a veſſel haſtily conſtructed with green timber, and by very unſkilful hands, without proviſions, without a compaſs, or a pilot. But his courage and alacrity ſupplied every defect. Committing himſelf fearleſsly to the guidance of the ſtream, the Napo bore him along to the ſouth, until he reached the great channel of the Maragnon. Turning with it towards the coaſt, he held on his courſe in that direction. He made frequent deſcents on both ſides the river, ſometimes ſeizing by force of arms the proviſions of the fierce ſavages ſeated on its banks, and ſometimes procuring a ſupply of food by a friendly intercourſe with more gentle tribes. After a long ſeries of dangers, which he encountered with amazing fortitude, and of diſtreſſes which he ſupported with no leſs magnanimity, he reached the ocean, where new perils awaited him. Theſe he likewiſe ſurmounted, and got ſafe to the

the Spanish settlement in the island Cubagua; from thence he sailed to Spain. The vanity natural to travellers who visit regions unknown to the rest of mankind, and the art of an adventurer, solicitous to magnify his own merit, concurred in prompting him to mingle an extraordinary proportion of the marvellous in the narrative of his voyage. He pretended to have discovered nations so rich, that the roofs of their temples were covered with plates of gold; and described a republic of women so warlike and powerful, as to have extended their dominion over a considerable tract of the fertile plains which he had visited. Extravagant as those tales were, they gave rise to an opinion, that a region abounding with gold, distinguished by the name of *El Dorado*, and a community of Amazons, were to be found in this part of the New World; and such is the propensity of mankind to believe what is wonderful, that it has been slowly, and with difficulty, that reason and observation have exploded these fables. The voyage, however, even when stripped of every romantic embellishment, deserves to be recorded, not only as one of the most memorable occurrences in that adventurous age, but as the first event that led to any certain knowledge of those immense regions that stretch eastward from the Andes to the ocean.

No words can describe the consternation of Pizarro, when he did not find the bark at the confluence of the Napo and Maragnon, where he had ordered Orellana to wait for him. He would not allow himself to suspect that a man, whom he had entrusted with such an important command, could be so base and so unfeeling as to desert him at such a juncture. But imputing his absence from the place of rendezvous to some unknown accident, he advanced above 50 leagues along the banks of the Maragnon, expecting every moment to see the bark appear with a supply of provisions. At length he came up with an officer whom Orellana had left to perish in the desert, because he had the courage to remonstrate against his perfidy. From him he learned the extent of Orellana's crime; and his followers perceived at once their own desperate situation, when deprived of their only resource. The spirit of the stoutest hearted veteran sunk within him; and all demanded to be led back instantly. Pizarro, though he assumed an appearance of tranquillity, did not oppose their inclination. But he was now 1200 miles from Quito; and in that long march the Spaniards encountered hardships greater than those they had endured in their progress outward, without the alluring hopes which then soothed and animated them under their sufferings. Hunger compelled them to feed on roots and berries, to eat all their dogs and horses, to devour the most loathsome reptiles, and even to gnaw the leather of their saddles and sword-belts. Four thousand Indians, and 210 Spaniards, perished in this wild and disastrous expedition, which continued near two years: and as 50 men were aboard the bark with Orellana, only 80 got back to Quito. These were naked like savages, and so emaciated with famine, or worn out with fatigue, that they had more the appearance of spectres than of men.

35 Extreme distress of Gonzales Pizarro and his men.

36 A conspiracy formed against the governor;

But, instead of returning to enjoy the repose which his condition required, Pizarro, on entering Quito, received accounts of a fatal event that threatened calamities more dreadful to him than those through which he had passed. From the time that his brother made the partial division of his conquests which has been mentioned, the adherents of Almagro, considering themselves as proscribed by the party in power, no longer entertained any hope of bettering their condition. Great numbers in despair resorted to Lima, where the house of young Almagro was always open to them: and the slender portion of his father's fortune, which the governor allowed him to enjoy, was spent in affording them subsistence. The warm attachment with which every person who served under the elder Almagro devoted himself to his interests, was quickly transferred to his son, who was now grown up to the age of manhood, and possessed all the qualities which captivate the affections of soldiers. Of a graceful appearance, dexterous at all martial exercises, bold, open, generous, he seemed to be formed for command; and as his father, conscious of his own inferiority from the total want of education, had been extremely attentive to have him instructed in every science becoming a gentleman, the accomplishments which he had acquired heightened the respect of his followers, as they gave him distinction and eminence among illiterate adventurers. In this young man the Almagrians found a point of union which they wanted; and looking up to him as their head, were ready to undertake any thing for his advancement. Nor was affection for Almagro their only incitement; they were urged on by their own distresses. Many of them, destitute of common necessaries, and weary of loitering away life, a burden to their chief, or to such of their associates as had saved some remnant of their fortune from pillage and confiscation, longed impatiently for an occasion to exert their activity and courage, and began to deliberate how they might be avenged on the author of all their misery. Their frequent cabals did not pass unobserved; and the governor was warned to be on his guard against men who meditated some desperate deed, and had resolution to execute it. But, either from the native intrepidity of his mind, or from contempt of persons whose poverty rendered their machinations of little consequence, he disregarded the admonitions of his friends. "Be in no pain (said he carelessly) about my life; it is perfectly safe, as long as every man in Peru knows that I can in a moment put him to death who dares to harbour a thought against it." This security gave the Almagrians full leisure to digest and ripen every part of their scheme; and Juan de Herrada, an officer of great abilities, who had the charge of Almagro's education, took the lead in their consultations, with all the zeal which that connection inspired, and with all the authority which the ascendant that he was known to have over the mind of his pupil gave him.

37 who is murdered.

On Sunday, the 26th of June, at midday, the season of tranquillity and repose in all sultry climates, Herrada, at the head of 18 of the most determined conspirators, sallied out of Almagro's house in complete armour; and drawing their swords, as they advanced hastily towards the governor's palace, cried out, "Long live the king, but let the tyrant die." Their associates, warned of their motions by a signal, were in arms at different stations ready to support them. Though Pizarro was usually surrounded by such a numerous train of attendants as suited the magnificence of the most opulent subject of the age in which he lived, yet as he was just risen from table, and most of his own domestics had retired

Peru. retired to their own apartments, the conspirators passed through the two outer courts of the palace unobserved. They were at the bottom of the staircase, before a page in waiting could give the alarm to his master, who was conversing with a few friends in a large hall. The governor, whose steady mind no form of danger could appal, starting up, called for arms, and commanded Francisco de Chaves to make fast the door. But that officer, who did not retain so much presence of mind as to obey this prudent order, running to the top of the staircase, wildly asked the conspirators what they meant, and whither they were going? Instead of answering, they stabbed him to the heart, and burst into the hall. Some of the persons who were there threw themselves from the windows; others attempted to fly; and a few drawing their swords, followed their leader into an inner apartment. The conspirators, animated with having the object of their vengeance now in view, rushed forward after them. Pizarro, with no other arms than his sword and buckler, defended the entry, and, supported by his half-brother Alcantara and his little knot of friends, maintained the unequal conquest with intrepidity worthy of his past exploits, and with the vigour of a youthful combatant. "Courage (cried he) companions, we are yet enow to make those traitors repent of their audacity." But the armour of the conspirators protected them, while every thrust they made took effect. Alcantara fell dead at his brother's feet; his other defendants were mortally wounded. The governor, so weary that he could hardly wield his sword, and no longer able to parry the many weapons furiously aimed at him, received a deadly thrust full in his throat, sunk to the ground, and expired.

As soon as he was slain, the assassins ran out into the streets, and waving their bloody swords, proclaimed the death of the tyrant. Above 200 of their associates having joined them, they conducted young Almagro in solemn procession through the city; and assembling the magistrates and principal citizens, compelled them to acknowledge him as lawful successor to his father in his government. The palace of Pizarro, together with the

38 Young Almagro heads the rebels. houses of several of his adherents, were pillaged by the soldiers; who had the satisfaction at once of being avenged on their enemies, and of enriching themselves by the spoils of those through whose hands all the wealth of Peru had passed.

The new governor marched into the heart of the empire, in order to reduce such places as refused to acknowledge his authority. A multitude of ruffians joined him on his march. His army breathed nothing but vengeance and plunder: every thing gave way before it. If the military talents of the general had equalled the ardour of his troops, the war had ended here. Unhappily for Almagro, he had lost his conductor John de Herrada. His inexperience made him fall into the snares that were laid for him by Pedro Alvares, who had put himself at the head of the opposite party. He lost, in attempting to unravel his plots, that time that he ought to have employed in fighting. In these circumstances, an event, which no one could have foreseen, happened to change the face of affairs.

The licentiate Vaca di Castro, who had been sent from Europe to try the murderers of old Almagro, arrived at Peru. As he was appointed to assume the government in case Pizarro was no more, all who had not sold themselves to the tyrant hastened to acknowledge him. Uncertainty and jealousy, which had for too long a time kept them dispersed, were no longer an obstacle to their re-union. Castro, who was as resolute as if he had grown old in the service, did not suffer their impatience to languish, but instantly led them against the enemy. The two armies engaged at Chapas on the 16th of September 1542, and fought with inexpressible obstinacy. Victory, after having wavered a long time, at the close of the day decided in favour of that party whose cause was the most just. Those among the rebels who were most guilty, dreading to languish under disgraceful tortures, provoked the conquerors to murder them, crying out, like men in despair, *It was I who killed Pizarro.* Their chief was taken prisoner, and died on the scaffold. 39 He is defeated by Vaca di Castro.

While these scenes of horror were transacting in America, the Spaniards in Europe were employed in finding out expedients to terminate them; though no measures had been taken to prevent them. Peru had only been made subject to the audience of Panama, which was too remote to superintend the maintenance of good order, and had too little influence to make its decrees respected. A supreme tribunal was then established at Lima for the dispensation of justice, which was to be invested with authority sufficient to enforce and to reward a due obedience to the laws. Blasco Nunez Vela, who presided in it as viceroy, arrived in 1544, attended by his subordinates in office, and found every thing in the most dreadful disorder.

To put an end to those tumults which now subsisted, would have required a profound genius, and many other qualities which are seldom united. Nunez had none of these advantages. Nature had only given him probity, firmness, and ardour; and he had taken no pains to improve these gifts. With these virtues, which were almost defects in his situation, he began to fulfil his commission, without regard to places, persons, or circumstances.

Contrary to the opinion of all intelligent persons, who wished that he should wait for fresh instructions from Europe, he published ordinances, which declared that the lands the conquerors had seized should not pass to their descendants, and which dispossessed those who had taken part in the civil commotions. All the Peruvians who had been enslaved by monks, bishops, and persons belonging to the government, were declared free. Those who belonged to other masters were to be freed from their shackles at the death of their oppressors. They could no longer be compelled to bury themselves in the mines, nor could any kind of labour be exacted from them without payment. Their tribute was fixed. The Spaniards who travelled on foot were deprived of the right of taking three Indians to carry their baggage; and those who travelled on horseback, of the right of taking five. The caciques were discharged from the obligation of furnishing the traveller and his retinue with provisions gratis. Other tyrannical establishments also would soon have been proscribed; and the conquered people were on the eve of being sheltered under the protection of laws, which would at least have tempered the rigours of the right of conquest, if even they had not entirely repaired 40 Bad conduct of the viceroy Nunez Vela.

repaired the injuſtice of them; but it ſhould ſeem that the Spaniſh government was only to be unfortunate in the good it attempted to effect.

A change ſo unexpected filled thoſe with conſternation who ſaw their fortunes wreſted from them, or who loſt the flattering hope of tranſmitting them to their poſterity. Even thoſe who were not affected by theſe intereſted views, being accuſtomed to look upon the Indians as the inſtruments and victims of their avarice, had no conception that any other ideas could prevail concerning them. From aſtoniſhment they proceeded to indignation, murmuring, and ſedition. The viceroy was degraded, put in irons, and baniſhed to a deſert iſland, till he could be conveyed to Spain.

Gonzales Pizarro was then returned from his hazardous expedition, which had employed him long enough to prevent him from taking a part in thoſe revolutions which had ſo rapidly ſucceeded each other. The anarchy he found prevailing at his return, inſpired him with the idea of ſeizing the ſupreme authority. His fame and his forces made it impoſſible that this ſhould be refuſed him; but his uſurpation was marked with ſo many enormities, that Nunez was regretted. He was recalled from exile, and ſoon collected a ſufficient number of forces to enable him to take the field. Civil commotions were then renewed with extreme fury by both parties. No quarter was aſked or given on either ſide. The Indians took part in this as they had done in the preceding wars; ſome ranged themſelves under the ſtandard of the viceroy, others under the banners of Gonzales. Fom 15,000 to 20,000 of theſe unhappy wretches, who were ſcattered about in each army, dragged up the artillery, levelled the roads, carried the baggage, and deſtroyed one another. Their conquerors had taught them to be ſanguinary. After a variety of advantages for a long time alternately obtained, fortune at length favoured the rebellion under the walls of Quito in the month of January, in the year 1545; and Nunez with the greateſt part of his men were maſſacred.

41 He is overcome and killed by Gonzales Pizarro.

Pizarro took the road of Lima, where they were deliberating on the ceremonies with which they ſhould receive him. Some officers wiſhed that a canopy ſhould be carried for him to march under, after the manner of kings. Others, with adulation ſtill more extravagant, pretended that part of the walls of the town, and even ſome houſes muſt be pulled down; as was the cuſtom at Rome, when a general obtained the honours of a triumph. Gonzales contented himſelf with making his entrance on horſeback, preceded by his lieutenant, who marched on foot. Four biſhops accompanied him, and he was followed by the magiſtrates. The ſtreets were ſtrewn with flowers, and the air reſounded with the noiſe of bells and various muſical inſtruments. This homage totally turned the head of a man naturally haughty, and of confined ideas. He ſpoke and acted in the moſt deſpotic manner.

Had Gonzales poſſeſſed judgment and the appearance of moderation, it would have been poſſible for him to render himſelf independent. The principal perſons of his party wiſhed it. The majority would have beheld this event with indifference, and the reſt would have been obliged to conſent to it. Blind cruelties, inſatiable avarice, and unbounded pride, altered theſe diſpoſitions. Even thoſe, whoſe intereſts were connected with thoſe of the tyrant, wiſhed for a deliverer.

Such a deliverer arrived from Europe in the perſon of the licentiate Pedro di la Gaſca. The ſquadron and the provinces of the mountains immediately declared for a perſon who was inveſted with a lawful authority to govern them. Thoſe who lived concealed in deſerts, caverns, and foreſts, quitted their retreats to join him. Gonzales, who ſaw no reſource left to ſupport him but in ſome great atchievement, took the road of Cuzco, with a reſolution to give battle. At ſome leagues diſtance from this place he met the royal army, and attacked it on the 9th of June 1548. One of his lieutenants, ſeeing him abandoned at the firſt charge by his beſt ſoldiers, adviſed him to throw himſelf into the enemy's battalions, and periſh like a Roman: but this weak man choſe rather to ſurrender, and end his life on a ſcaffold. Carvajal, a more able warrior, and more ferocious than himſelf, was quartered. This man, when he was expiring, boaſted that he had maſſacred with his own hand 1400 Spaniards and 20,000 Indians.

42 An end put to the troubles by Pedro di la Gaſca.

Such was the laſt ſcene of a tragedy, of which every act has been marked with blood. The government was moderate enough not to continue the proſcriptions; and the remembrance of the horrid calamities they had ſuffered kept the Spaniards in the bounds of ſubjection. What ſtill remained of that commotion that had been raiſed in their minds, inſenſibly ſunk into a calm; and the country hath remained in quiet ever ſince.

With regard to the Peruvians, the moſt cruel meaſures were taken to render it impoſſible for them to rebel. Tupac Amaru, the heir of their laſt king, had taken refuge in ſome remote mountains, where he lived in peace. There he was ſo cloſely ſurrounded by the troops which had been ſent out againſt him, that he was forced to ſurrender. The viceroy Francis de Toledo cauſed him to be accuſed of ſeveral crimes that he had not committed, and for which he was beheaded in 1571. All the other deſcendants of the Incas ſhared the ſame fate, under pretence that they had conſpired againſt their conquerors. The horror of theſe enormities excited ſo univerſal an indignation both in the Old and the New World, that Philip II. thought himſelf obliged to diſavow them; but the infamous policy of this prince was ſo notorious, that no credit was given to this appearance of his juſtice and humanity.

43 Hard fate of the Peruvians.

The empire of Peru, at the time it was ſubdued, extended along the South ſea, from the river of Emeralds to Chili, and on the land ſide to Popayan, according to ſome geographers. It contained within its extent that famous chain of mountains which riſes in the Terra Magellanica, and is gradually loſt in Mexico, in order to unite, as it ſhould ſeem, the ſouthern parts of America with the northern.

44 Extent of the empire.

It is now divided into three grand diviſions or audiences; Quito, Lima or Los Reyes, and Los Charcos. As to its climate, mines, ſoil, and produce, they differ greatly in different parts of the country.

Payne's Geography.

The extenſive province of Quito is bounded on the north by Popayan, and includes a part of that government, alſo by Santa Fe de Bogota; on the ſouth by the governments of Piura and Chachapoyas; on the eaſt it extends over the whole government of Maynas and

45 Province of Quito.

and the river of the Amazons to the meridian, which divides the Spaniſh from the Portugueſe dominions; and on the weſt it is bounded by the South ſea; extending, according to Antonio de Ulloa, 600 leagues in length, and about 200 in its greateſt breadth; but this greatly exceeds the computation of all other geographers. He however obſerves, that it muſt be owned a great part of thoſe vaſt dominions are either inhabited by nations of Indians, or have not hitherto been ſufficiently peopled by the Spaniards, if indeed they have been thoroughly known; and that all the parts that can properly be ſaid to be peopled, and actually ſubject to the Spaniſh government, are thoſe intercepted by the two Cordilleras of the Andes, which, in compariſon to the extent of the country, may be termed a ſtreet or lane, 15 leagues, or ſometimes more, from eaſt to weſt; to this muſt be added ſeveral detached governments, ſeparated by the very extenſive tracts inhabited by free Indians.

46 Climate, ſeaſons, &c. of this province.

The climate of Quito differs from all others in the ſame parallel, ſince even in the centre of the torrid zone, or although under the equinoctial, the heat is not only very tolerable, but even in ſome places the cold is painful; while others enjoy all the advantages of a perpetual ſpring, the fields being conſtantly covered with verdure, and enamelled with flowers of the moſt lively colours. The mildneſs of the climate, free from the extremes of heat and cold, and the conſtant equality of the day and night, render this country, which from its ſituation might be thought to be parched by the conſtant heat of the ſun, and ſcarcely inhabitable, both pleaſant and fertile; for nature has here diſpenſed her bleſſings with ſo liberal a hand, that this country in ſeveral reſpects ſurpaſſes thoſe of the temperate zones, where the viciſſitudes of winter and ſummer, and the change from heat to cold, cauſe the extremes of both to be more ſenſibly felt. However, in different parts of the country, the air is very different; in one part are mountains of a ſtupendous height and magnitude, with their ſummits covered with ſnow. The plains are temperate, the valleys hot, and, according to the high or low ſituation of the country, are found all the variety of gradations in temperature poſſible to be conceived between the extremes of heat and cold.

Quito, the capital, in 13′ ſouth latitude, and 77° 50′ weſt longitude from Greenwich, is ſo happily ſituated, that neither heat nor cold are troubleſome, though both may be felt in its neighbourhood; and what renders this equality more delightful is, that it is conſtant throughout the whole year, the difference between the ſeaſons being ſcarce perceptible. Indeed the mornings are cool, the remainder of the day warm, and the nights of an agreeable temperature. See QUITO.

The winds, which are pure and ſalubrious, blow for the moſt part from north to ſouth, but never with any violence, though they ſometimes ſhift their quarters, but without any regard to the ſeaſon of the year. Such ſignal advantages reſulting from the climate, ſoil, and aſpect of this country, would be ſufficient to render it the moſt enviable ſpot upon earth, as it is ſuppoſed to be the moſt elevated, if, whilſt enjoying theſe delights, the inhabitants were not haraſſed by terror, and expoſed to continual danger; for here tremendous tempeſts of thunder and lightning prevail, which are ſufficient to appal the ſtouteſt heart; whilſt earthquakes frequently ſpread univerſal apprehenſions, and ſometimes bury cities in ruins.

The diſtinction of winter and ſummer conſiſts in a very minute difference; the interval between the month of September and thoſe of April, May, or June, is here called the winter ſeaſon, and the other months compoſe the ſummer. In the former ſeaſon the rain chiefly prevails, and in the latter the inhabitants frequently enjoy whole days of fine weather; but whenever the rains are diſcontinued for above a fortnight, the inhabitants are in the utmoſt conſternation, and public prayers are offered up for their return. On the other hand, when they continue a ſhort time without intermiſſion, the like fears prevail, and the churches are again crowded with ſupplicants to obtain fine weather; for a long drought produces dangerous diſeaſes, and a continual rain, without intervals of ſunſhine, deſtroys the fruits of the earth. The city of Quito, however, enjoys one peculiar advantage, in being free from muſketoes and other troubleſome inſects, ſuch as fleas and venomous reptiles, except the *nigua* or *pique*, which is a very ſmall inſect ſhaped like a flea, but hardly viſible to the ſight.

The fertility of the ſoil here is incredible, for the fruits and beauties of the ſeveral ſeaſons are viſible at the ſame time; and the curious European obſerves with a pleaſing admiration, that while ſome herbs of the field are fading, others of the ſame kind are ſpringing up; while ſome flowers loſe their beauty, others blow to continue the enamelled proſpect: thus, when the fruits of the trees have attained their maturity, and the leaves begin to change their colour, freſh leaves bloſſom, and fruits are ſeen in their proper gradations in ſize and ripeneſs on the ſame tree. The ſame inceſſant fertility is conſpicuous in the corn, both reaping and ſowing being carried on at the ſame time: ſo that the declivities of the neighbouring hills exhibit all the beauties of the four ſeaſons in one aſſemblage. Though all this is generally ſeen, yet there is a ſettled time for the grand harveſt: yet ſometimes the moſt favourable ſeaſon for ſowing in one place is a month or two after that of another, though their diſtance does not exceed three or four leagues. Thus in different ſpots, and ſometimes in one and the ſame, ſowing and reaping are performed throughout the whole year, the forwardneſs or retardment naturally ariſing from the different ſituations, ſuch as mountains, riſing grounds, plains, and valleys; and the temperature being different in each, the beſt times for performing the ſeveral operations of huſbandry muſt alſo differ. 47 Soil, produce, &c.

The *chirimoya* is conſidered as one of the moſt delicious fruits in the world. Its dimenſions are various, being from one to five inches in diameter. Its figure is imperfectly round, flatted towards the ſtalk, where it forms a kind of navel; but all the other parts are nearly circular. It is covered with a thin ſoft ſhell, which adheres ſo cloſely to the pulp as not to be ſeparated from it without a knife. The outward coat is green, variegated with prominent veins, forming all over it a kind of net-work. The pulp is white, and contains a large quantity of juice reſembling honey, of a ſweet taſte, mixed with a gentle acid of a moſt exquiſite flavour. The ſeeds are formed in ſeveral parts of the pulp, and are ſomewhat flat. The tree is high and tufted, the ſtem large and round, but with ſome inequalities,

Peru. qualities, full of elliptic leaves, terminating in a point. The bloſſom differs little from the colour of the leaves, which is a darkiſh green; and though far from being beautiful, is remarkable for its incomparable fragrance.

The *granadilla* in its ſhape reſembles an hen's egg, but is larger. The outſide of the ſhell is ſmooth, gloſſy, and of a faint carnation colour, and the inſide white and ſoft. The ſhell contains a viſcous liquid ſubſtance, full of very ſmall and delicate grains, leſs hard than thoſe of the pomegranate. This medullary ſubſtance is ſeparated from the ſhell by a fine and tranſparent membrane. Its fruit has a delightful ſweetneſs blended with acidity, very cordial and refreſhing, and ſo wholeſome, that there is no danger of eating to exceſs.

The *frutilla*, or Peruvian ſtrawberry, is very different from that of Europe in ſize; though they are here generally not above an inch in length, they are much larger in other parts of Peru; but their taſte, though juicy, and not unpalatable, is not equal to thoſe in Europe.

48 Inhabitants. The country is obſerved to abound more in women than in men, which is the more remarkable, as thoſe cauſes which induce men to leave their country, as travelling, commerce, and war, naturally bring over more men from Europe than women. But there are many families in which there are a number of daughters, without one ſon among them. The women enjoy a better ſtate of health than the men, which may be owing in ſome meaſure to the climate, and more particularly to the early intemperance and voluptuouſneſs of the other ſex.

The Creoles are well made, of a proper ſtature, and of a lively and agreeable countenance. The Meſtizos are alſo in general well made, often taller than the ordinary ſize, very robuſt, and have an agreeable air. The Indians, both men and women, are commonly low of ſtature, though ſtrong and well proportioned; but more natural defects are to be found among them than in any of the reſt. Some are remarkably ſhort, ſome idiots, dumb, or blind. Their hair is generally thick and long, which they wear looſe on their ſhoulders; but the Indian women plait theirs behind with a ribbon, and cut that before a little above the eyebrows, from one ear to the other. The greateſt diſgrace that can be offered to an Indian of either ſex is to cut off their hair; for whatever corporal puniſhment their maſters think proper to inflict on them, they bear with patience; but this affront they never forgive; and accordingly the government has interpoſed, and limited this puniſhment to the moſt enormous crimes. The colour of the hair is generally a deep black: it is lank, harſh, and as coarſe as that of a horſe. On the contrary, the male Meſtizos, in order to diſtinguiſh themſelves from the Indians, cut off their hair; but the females do not adopt that cuſtom.

49 Their dreſs. The Meſtizos in general wear a blue cloth, manufactured in this country; but though they are the loweſt claſs of Spaniards, they are very ambitious of diſtinguiſhing themſelves as ſuch, either by the colour or faſhion of the clothes they wear.

The Meſtizo women affect to dreſs in the ſame manner as the Spaniſh, though they cannot equal the ladies in the richneſs of their ſtuffs. The meaner ſort wear no ſhoes; but like the men of the ſame rank go barefooted.

The dreſs of the Indians conſiſts of white cotton drawers, which hang down to the calf of the leg, where they are looſe, and edged with a lace ſuitable to the ſtuff. The uſe of a ſhirt is ſupplied by a black cotton frock, made in the form of a ſack, with three openings at the top, one in the middle for the head, and others at the corners for the arms; thus covering their naked bodies down to the knees. Over this is a ſerge cloak, with a hole in the middle for putting the head through, and a hat made by the natives. This is their general dreſs, which they never lay aſide, even while they ſleep; and they have no additional clothing for their legs or feet. The Indians, who have acquired ſome fortune, particularly the barbers and phlebotomiſts, diſtinguiſh themſelves from their countrymen by the fineneſs of their drawers, and by wearing a ſhirt, which, though without ſleeves, has a lace four or five fingers in breadth, faſtened round like a kind of ruff or band. They are fond of ſilver or gold buckles to their ſhoes, though they wear no ſtockings; and inſtead of a mean ſerge cloak, wear one of fine cloth, which is often adorned with gold or ſilver lace.

There are two kinds of dreſſes worn by the Indian women, made in the ſame plain manner with thoſe worn by the men in general, the whole conſiſting of a ſhort petticoat and a veil of American baize. But the dreſs of the loweſt claſs of Indian women is only a bag of the ſame make and ſtuff as that of the men, which they faſten on their ſhoulders with two large pins: it reaches down to the calf of the leg, and is faſtened round the waiſt with a kind of girdle. Inſtead of a veil, they wear about the neck a piece of the ſame coarſe ſtuff dyed black; but their arms and legs are naked.

The people have diſhes unknown in Europe; but are particularly fond of cheeſe; and have excellent butter in the neighbourhood of Quito. Sweetmeats are very much admired. 50 Food and drink, &c.

Rum is commonly drank here by perſons of all ranks, but their favourite liquor is brandy. The diſorders ariſing from the exceſſive uſe of ſpirituous liquors are chiefly ſeen among the Meſtizos; and the lower claſs of women, both among the Creoles and Meſtizos, are alſo extremely addicted to the ſame ſpecies of debauchery.

Another liquor much uſed in this country is mate, which is made of an herb known in all theſe parts of America by the name of Paraguay, as being the produce of that country. Some of it is put into a calabaſh tipped with ſilver, called here *mate*, with ſugar and ſome cold water. After it has continued there ſome time, the calabaſh is filled with boiling water, and they drink the liquor through a pipe fixed in the calabaſh. It is alſo uſual to ſqueeze into the liquor a ſmall quantity of the juice of lemons or Seville oranges, mixed with ſome perfumes from odoriferous flowers. This is their uſual drink in the morning faſting, and many uſe it alſo at their evening regale. The manner of drinking it appears very indelicate, the whole company taking it ſucceſſively through the ſame pipe, it being carried ſeveral times round the company till all are ſatisfied. This among the Creoles is the higheſt enjoyment: ſo that

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that when they travel, they never fail to carry with them a sufficient quantity of it, and till they have taken their dose of mate they never eat.

The vice of gaming is here carried to an extravagant height, to the ruin of many families, some losing their stocks in trade, others the very clothes from their backs, and afterwards those belonging to their wives, which they hazard, stimulated by the hope of recovering their own.

The common people, the Indians, and even the domestics, are greatly addicted to stealing. The Mestizos, though arrant cowards, do not want audacity in this way; for though they will not venture to attack any one in the street, it is a common practice to snatch off a person's hat, and immediately seek their safety in flight. This acquisition is sometimes of considerable value; the hats worn by persons of rank, and even by the wealthy citizens when dressed, being of white beaver, worth fifteen dollars, beside the hatband of gold or silver lace, fastened with a gold buckle set with diamonds or emeralds. Robberies on the highway are seldom heard of.

51 Language.

In Quito, and all the towns and villages of its province, different dialects are spoken, Spanish being no less common than the Inga, the language of the country. The Creoles use the latter as much as the former, but both are considerably adulterated by borrowed words and expressions. The first language generally spoken by children is the Inga; for the nurses being Indians, many of them do not understand a word of Spanish, and thus they afterward learn a jargon composed of both languages.

52 Honour paid the dead.

The sumptuous manner of performing the last offices for the dead, demonstrates how far the power of habit is capable of prevailing over reason and prudence, for their ostentation is so great in this particular, that many families of credit are ruined by preposterously endeavouring to excel others; and the people here may be said to toil and scheme to lay up wealth, to enable their successors to lavish honours upon a body insensible of all pageantry.

53 Commerce.

The commerce of the province of Quito is chiefly carried on by Europeans settled here, and others who occasionally arrive. The manufactures of this province are only cottons, some white and striped baize, and cloths, which meet with a good market at Lima, for supplying the inward provinces of Peru. The returns are made partly in silver, and partly in fringes made of gold and silver thread, and wine, brandy, oil, copper, tin, lead, and quicksilver. On the arrival of the galleons at Carthagena, these traders resort thither to purchase European goods, which, at their return, they consign to their correspondents all over the province. The coasts of New Spain supply this province with indigo, of which there is a very large consumption at the manufactures, blue being universally the colour which this people adopt for their apparel. They also import, by way of Guayaquila, iron and steel both from Europe and the coast of Guatemala.

54 Disposition of the inhabitants.

The disposition of the Indians in the province of Quito is extremely remarkable, and they appear to have no resemblance to the people found there by those who first discovered the country. They at present possess a tranquillity not to be disturbed either by fortunate or unfortunate events. In their mean apparel they are as contented as a prince clothed in the most splendid robes. They show the same disregard to riches; and even the authority and grandeur within their reach is so little the object of their ambition, that to all appearance it seems to be the same to an Indian whether he be created an alcalde, or obliged to perform the office of a common executioner.

Their sloth is so great that scarcely any thing can induce them to work. Whatever therefore is necessary to be done is left to the Indian women, who are much more active; they spin and make the half shirts and drawers which form the only apparel of their husbands; they cook the provisions, grind barley, and brew the beer called *chicha*; while the husband sits squatting on his hams, the usual posture of the Indians, looking at his busy wife. The only domestic service they do is to plough their little spot of land, which is sowed by the wife. When they are once seated on their hams, no reward can induce them to stir; so that if a traveller has lost his way, and happens to come to one of their cottages, they charge their wives to say that they are not at home. Should the passenger alight and enter the cottage, the Indian would still be safe; for having no light but what comes through a hole in the door, he could not be discovered; and should the stranger even see the Indian, neither entreaties nor rewards would prevail on him to stir a step with him.

They are lively only in parties of pleasure, rejoicings, entertainments, and especially dancing; but in all these the liquor must circulate briskly, and they continue drinking till they are entirely deprived both of sense and motion.

It is remarkable that the Indian women, whether maids or married, and Indian young men before they are of an age to contract matrimony, are never guilty of this vice: it being a maxim among them, that drunkenness is the privilege of none but masters of families, who, when they are unable to take care of themselves, have others to take care of them.

The women present the chicha (A) to their husbands in calabashes, till their spirits are raised; then one plays on a pipe and tabor, while others dance. Some of the best voices among the Indian women sing songs in their own language, and those who do not dance, squat down in the usual posture till it comes to their turn. When tired with intemperance, they all lie down together, without regarding whether they be near the wife of another or their own sister or daughter. These festivities sometimes continue three or four days, till the priest coming

(A) This is a liquor made from maize by the following process. The maize, after being soaked in water till it begin to grow, is dried in the sun, then parched a little, and at last ground. The flour, after it has been well kneaded, is put with water into a large vessel, and left for two or three days to ferment. Its taste is nearly that of the most indifferent kind of cyder. It is a refreshing, nourishing, and aperitive liquor; but it will not keep above eight days without turning sour.

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coming among them, throws away all the chicha, and disperses the Indians, lest they should procure more.

Their funerals are likewise solemnized with excessive drinking. The house is filled with jugs of chicha, for the solace of the mourners and other visitors; the latter even go out into the streets, and invite all of their nation who happen to pass by to come in and drink to the honour of the deceased. This ceremony lasts four or five days, and sometimes more, strong liquor being their supreme enjoyment.

55 Their manner of contracting marriages.

The Indians in the audience of Quito are said to act contrary to all other nations in their marriages; for they never make choice of a woman who has not been first enjoyed by others, which they consider as a certain indication of her personal attractions. After a young man has made choice of a woman, he asks her of her father, and having obtained his consent, they begin to cohabit together as man and wife, and assist the father-in-law in cultivating the land. At the end of three or four months, and frequently of a year, the husband leaves his bride or wife without any ceremony; and perhaps expostulates with his father-in-law for endeavouring to deceive him, by imposing upon him his daughter, whom nobody else had thought worthy of making a bedfellow. But if no disgust arises in the man on this account or any other, after passing three or four months in this commerce, which they call *amanarse*, or to habituate one's self, they then marry. This custom is still very common, though the whole body of the clergy have used all their endeavours to put a stop to it. Accordingly they always absolve them of that sin before they give them the nuptial benediction.

56 Appearance of the country in this province.

It has been observed, that the dependencies of the jurisdictions of Quito are seated between the two Cordilleras of the Andes, and that the air is more or less cold, and the ground more or less sterile, according to the height of the mountains. These barren tracts are called deserts: for though all the Cordilleras are dry, some are much more so than others; and the continual snow and frosts render some parts of them incapable of producing a single plant, and consequently they are uninhabitable by man or beast.

Some of these mountains, which appear to have their bases resting on other mountains, rise to a most astonishing height, and, reaching far above the clouds, are here, although in the midst of the torrid zone, covered with perpetual snow. From experiments made with a barometer on the mountain of Cotopaxi, it appeared that its summit was elevated 6252 yards above the surface of the sea, something above three geographical miles, which greatly exceeds the height of any other mountain in the known world.

Cotopaxi became a volcano about the time when the Spaniards first arrived in this country. A new eruption happened in 1743, which had been for some days preceded by a continual interior rumbling noise; after which an aperture was made in its summit, as also three others near the middle of its declivity; these parts, when the eruption commenced, were buried under prodigious masses of snow. The ignited substances which were ejected being mingled with a considerable quantity of snow and ice, melting amidst the flames, were carried down with such amazing rapidity, that the plain from Callo to Latacunga was overflowed, and all the houses with their wretched inhabitants were swept away in one general and instantaneous destruction. The river of Latacunga was the receptacle of this dreadful flood, till becoming swollen above its banks, the torrent rolled over the adjacent country, continuing to sweep away houses and cattle, and rendered the land near the town of the same name as the river one vast lake. Here, however, the inhabitants had sufficient warning to save their lives by flight, and retreated to a more elevated spot at some distance. During three days the volcano ejected cinders, while torrents of lava with melted ice and snow poured down the sides of the mountain. The eruption continued for several days longer, accompanied with terrible roarings of the wind, rushing through the craters which had been opened. At length all was quiet, and neither smoke nor fire were to be seen; until in May 1744 the flames forced a passage through several other parts on the sides of the mountain; so that in clear nights the flames, being reflected by the transparent ice, exhibited a very grand and beautiful illumination. On the 13th of November following, it ejected such prodigious quantities of fire and lava, that an inundation equal to the former soon ensued, and the inhabitants of the town of Latacunga for some time gave themselves over for lost.

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The most southern mountain of the Cordilleras is that of Mecas or Sangay, which is of a prodigious height, and the far greatest part of it covered with snow; yet from its summit issues a continual fire, attended with explosions which are plainly heard at 40 leagues distance. The country adjacent to this volcano is entirely barren, being covered with cinders ejected from its mouth. In this mountain rises the river Sangay, which being joined by the Upano, forms the Payra, a large river which discharges itself into the Maranon.

Pichincha, though famous for its great height, is 1278 yards lower than the perpendicular height of Cotopaxi, and was formerly a volcano, but the mouth or crater on one of its sides is now covered with sand and calcined matter; so that at present neither smoke nor fire issue from it. When Don George Juan and Don Antonio de Ulloa were stationed on it for the purpose of making astronomical observations, they found the cold on the top of this mountain extremely intense, the wind violent, and they were frequently involved in so thick a fog, or, in other words, a cloud, that an object at six or eight paces distance was scarcely discernible. The air grew clear, by the clouds moving nearer to the earth, and on all sides surrounding the mountain to a vast distance, representing the sea with the mountain standing like an island in the centre. When this happened, they heard the dreadful noise of the tempests that discharged themselves on Quito and the neighbouring country. They saw the lightning issue from the clouds, and heard the thunder roll far beneath them. While the lower parts were involved in tempests of thunder and rain, they enjoyed a delightful serenity; the wind was abated, the sky clear, and the enlivening rays of the sun moderated the severity of the cold. But when the clouds rose, their thickness rendered respiration difficult; snow and hail fell continually, and the wind returned with all its violence; so that it was impossible entirely to overcome the fear of being, together with their hut, blown down the precipice on whose edge it was built, or of being buried in it by the constant

Peru.

ſtant accumulations of ice and ſnow. Their fears were likewiſe increaſed by the fall of enormous fragments of rocks. Though the ſmalleſt crevice viſible in their hut was ſtopped, the wind was ſo piercing that it penetrated through; and though the hut was ſmall, crowded with inhabitants, and had ſeveral lamps conſtantly burning, the cold was ſo great, that each individual was obliged to have a chafing-diſh of coals, and ſeveral men were conſtantly employed every morning to remove the ſnow which fell in the night. By the ſeverities of ſuch a climate their feet were ſwelled, and ſo tender that walking was attended with extreme pain, their hands covered with chilblains, and their lips ſo ſwelled and chopt that every motion in ſpeaking drew blood.

57 Province of Lima.

The next diviſion of Peru is the audience of Lima, which is bounded on the north by Quito, on the eaſt by the Cordilleras of the Andes, on the ſouth by the audience of Los Charcos, and on the weſt by the Pacific ocean, it being about 770 miles in length from north to ſouth, being of an unequal breadth.

58 Climate, ſoil, &c. in this province.

The climate and ſoil of this country is uncommonly various; in ſome places it is exceedingly hot, in others inſupportably cold; and in the city of Lima, where rain never falls, it is always temperate. The ſeaſons vary within the compaſs of a few miles, and in certain parts of the audience all the viciſſitudes of weather are experienced in 24 hours. It is extremely remarkable that no rains fall or rivers flow on the ſea coaſts, though the country is refreſhed by thick fogs, and the heat abated by denſe clouds that never condenſe into ſhowers. This phenomenon has drawn the attention of many naturaliſts, without their being able ſatisfactorily to account for it.

Spring begins toward the cloſe of the year, that is about the end of November or the beginning of December, when the vapours which fill the atmoſphere during the winter ſubſide, and the ſun, to the great joy of the inhabitants, again appears, and the country then begins to revive, which, during the abſence of his rays, had continued in a ſtate of languor. This is ſucceeded by ſummer, which, though hot from the perpendicular direction of the ſun's rays, is far from being inſupportable; the heat, which indeed would otherwiſe be exceſſive, being moderated by the ſouth winds, which always blow at this ſeaſon, though with no great force. Winter begins at the latter end of June or the beginning of July, and continues till November or December, when the ſouth winds begin to blow ſtronger, and to produce a certain degree of cold, not indeed equal to that in countries where ice and ſnow are known, but ſo keen that the light dreſſes are laid by, and cloth or other warm ſtuffs worn. During the winter the earth is covered with ſo thick a fog, as totally to intercept the rays of the ſun; and the winds, by blowing under the ſhelter of this fog, retain the particles they contracted in the frozen zone. In this ſeaſon only the vapours diſſolve into a very ſmall dew, which everywhere equally moiſtens the earth; by which means all the hills, which during the other parts of the year offer nothing to the ſight but rocks and waſtes, are clothed with verdure and enamelled with flowers of the moſt beautiful colours. Theſe dews never fall in ſuch quantities as to impair the roads or incommode the traveller; a very thin ſtuff will not ſoon be wet through; but the continuance of the miſts during the whole winter, without being exhaled by the ſun, fertilizes every part of the country.

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From a table of meteorological obſervations made in the city of Lima, from the month of March 1791, to March 1792, it appears that the thermometer was loweſt during the month of September, when it deſcended to 62°, and that it was higheſt in the month of March, when it roſe as high as 84°. Theſe temperatures denote the extremes of heat and cold in the winter and ſummer of this climate.

Lima is as free from tempeſts as from rain; ſo that thoſe of the inhabitants who have neither viſited the mountains nor travelled into other parts, are abſolute ſtrangers to thunder and lightning, and are therefore extremely terrified when they firſt hear the former or ſee the latter. But it is very remarkable, that what is here entirely unknown ſhould be ſo common 30 leagues to the eaſt of Lima; it being no farther to the mountains, where violent rains and tempeſts of thunder and lightning are as frequent as at Quito.

But though the capital is freed from the terror of theſe tempeſts, it is ſubject to what is much more dreadful. Earthquakes happen here ſo frequently, that the inhabitants are under continual apprehenſions of being, from their ſuddenneſs and violence, buried in the ruins of their own houſes: yet theſe earthquakes, though ſo ſudden, have their preſages, one of the principal of which is a rumbling noiſe in the bowels of the earth about a minute before the ſhocks are felt, that ſeems to pervade all the adjacent ſubterraneous part; this is followed by diſmal howlings of the dogs, who ſeem to preſage the approaching danger. The beaſts of burden paſſing the ſtreets ſtop, and by a natural inſtinct ſpread open their legs, the better to ſecure themſelves from falling. On theſe portents the terrified inhabitants fly from their houſes into the ſtreets with ſuch precipitation, that if it happens in the night they appear quite naked; the urgency of the danger at once baniſhing all ſenſe of delicacy or ſhame. Thus the ſtreets exhibit ſuch odd and ſingular figures as might afford matter of diverſion, were it poſſible to be diverted in ſo terrible a moment. This ſudden concourſe is accompanied with the cries of children waked out of their ſleep, blended with the lamentations of the women, whoſe agonizing prayers to the ſaints increaſe the common fear and confuſion. The men are alſo too much affected to refrain from giving vent to their terror; ſo that the whole city exhibits a dreadful ſcene of conſternation and horror.

The earthquakes that have happened at the capital are very numerous. The firſt ſince the eſtabliſhment of the Spaniards was in 1582; but the damage was much leſs conſiderable than in ſome of the ſucceeding. Six years after Lima was again viſited by another earthquake, ſo dreadful, that it is ſtill ſolemnly commemorated every year. In 1609 another happened, which overturned many houſes. On the 27th of November 1630, ſuch prodigious damage was done in the city by an earthquake, that, in acknowledgement of its not having been entirely demoliſhed, a feſtival on that day is annually celebrated. Twenty-four years after, on the 3d of November, the moſt ſtately edifices in the city, and a great number of houſes, were deſtroyed by an earthquake; but the inhabitants retiring, few of them periſhed. Another dreadful one happened in 1678; but one of the moſt terrible was on the 28th of October

1687.

1687. It began at four in the morning, and deſtroyed many of the fineſt public buildings and houſes, in which a great number of the inhabitants periſhed; but this was little more than a prelude to what followed; for two hours after, the ſhock returned with ſuch impetuous concuſſions, that all was laid in ruins, and the inhabitants felt themſelves happy in being only ſpectators of the general devaſtation, by having ſaved their lives, though with the loſs of all their property. During this ſecond ſhock, the ſea retiring conſiderably, and then returning in mountainous waves, entirely overwhelmed Callao, which is at five miles diſtance from Lima, and all the adjacent country, together with the miſerable inhabitants. From that time ſix earthquakes have happened at Lima previous to that of 1746. This laſt was on the 28th of October, at half an hour after ten at night, when the concuſſions began with ſuch violence, that in little more than three minutes the greateſt part, if not all the buildings in the city, were deſtroyed, burying under their ruins thoſe inhabitants who had not made ſufficient haſte into the ſtreets and ſquares, the only places of ſafety. At length the horrible effects of the firſt ſhock ceaſed; but the tranquillity was of ſhort duration, the concuſſions ſwiftly ſucceeding each other. The fort of Callao alſo ſunk into ruins; but what it ſuffered from the earthquake in its building was inconſiderable, when compared to the dreadful cataſtrophe which followed; for the ſea, as is uſual on ſuch occaſions, receding to a conſiderable diſtance, returned in mountainous waves, foaming with the violence of the agitation, and ſuddenly buried Callao and the neighbouring country in its flood. This, however, was not entirely effected by the firſt ſwell of the waves; for the ſea retiring farther, returned with ſtill greater impetuoſity, and covered both the walls and other buildings of the place; ſo that whatever had eſcaped the firſt inundation was totally overwhelmed by thoſe ſucceeding mountainous waves. Twenty-three ſhips and veſſels, great and ſmall, were then in the harbour, 19 of which were ſunk, and the other four, among which was a frigate named St Fermin, were carried by the force of the waves to a conſiable diſtance up the country. This terrible inundation and earthquake extended to other parts on the coaſt, and ſeveral towns underwent the ſame fate as the city of Lima; where the number of perſons who periſhed within two days after it began, amounted, according to the bodies found, to 1300, beſide the maimed and wounded, many of whom lived only a ſhort time in great torture. The preſent population of this city, taken from accurate ſources, amounts to 52,627.

The country of Lima enjoys great fertility, producing all kinds of grain and a prodigious variety of fruit. Here induſtry and art ſupply that moiſture which the clouds withhold. The ancient incas of Peru cauſed ſmall canals to be formed, in order to conduct the waters of the rivers to every part of the country. The Spaniards, finding theſe uſeful works executed to their hands, had only to keep them in order; and by theſe are watered ſpacious fields of barley, large meadows, plantations, vineyards, and gardens, all yielding uncommon plenty. Lima differs from Quito, where the fruits of the earth have no determined ſeaſon; for here the harveſt is gathered in, and the trees drop their leaves in the proper ſeaſon.

Although the ſummer here is hot, yet venomous creatures are unknown; and the ſame may be ſaid of the territory called *Valles*, though here are ſome ports, as Tumbez and Piura, where the heat is almoſt as great as that of Guayaquil. This ſingularity can therefore proceed from no other cauſe than the natural drought of the climate.

59. Diviſions of the audience of Lima.

The audience of Lima is divided into four biſhoprics, Truxillo, Guamanga, Cuſco, and Arequipa. The dioceſe of Truxillo lies to the north of the archiepiſcopal dioceſe of Lima, and like all the others is divided into ſeveral juriſdictions. The city of Truxillo is ſeated in 8° 6′ ſouth latitude, in a pleaſant ſituation, though in a ſandy ſoil.

In the dioceſe of Guamanga is a rich quickſilver mine, from which the inhabitants of a neighbouring town procure their whole ſubſiſtence; the coldneſs of the air in that place checking the growth of all kinds of grain and fruit, ſo that they are obliged to purchaſe them from their neighbours. The quickſilver mines wrought here ſupply all the ſilver mines in Peru with that neceſſary mineral, and notwithſtanding the prodigious quantities already extracted, no diminution is perceived.

Cuſco, which gives name to another dioceſe, is the moſt ancient city of Peru, being of the ſame date with the empire of the incas, and was founded by them as the capital of the empire. On the mountain contiguous to the north part of the city are the ruins of a famous fort built by the incas; whence it appears that their deſign was to incloſe the whole mountain with a prodigious wall, of ſuch conſtruction as to render its aſcent abſolutely impracticable to an enemy, in order to prevent all approach to the city. This wall was entirely of free-ſtone, and ſtrongly built, ſome of the ſtones being of a prodigious magnitude. The city of Cuſco is nearly equal to that of Lima. See Cusco.

In this biſhopric are ſeveral mines of gold and ſilver, that are extremely rich.

The fourth dioceſe of the audience of Lima is Arequipa, which contains the city of the ſame name, one of the largeſt in Peru. It is delightfully ſituated in a plain; the houſes are well built of ſtone, and are generally lofty, commodious, finely decorated on the outſide, and neatly furniſhed within. The temperature of the air is extremely agreeable, the cold being never exceſſive, or the heat troubleſome; ſo that the fields are always clothed with verdure, and enamelled with flowers, as in a perpetual ſpring. But theſe advantages are allayed by its being frequently expoſed to dreadful earthquakes; for by theſe convulſions of nature it has been four times laid in ruins. The city is, however, very populous, and among its inhabitants are many noble families.

In this biſhopric are ſeveral gold and ſilver mines, and in ſome parts are large vineyards, from which conſiderable quantities of wine and brandy are made. Among the other productions is Guinea pepper, in which the juriſdiction of Arica in this dioceſe carries on a very advantageous trade, the annual produce of theſe plantations bringing in no leſs than 60,000 dollars per annum. The pods of this pepper are about a quarter of a yard in length, and when gathered are dried in the ſun and packed up in bags of ruſhes, each bag containing an aroba or a quarter of a hundred weight, and thus they are exported to all parts. Other places of this

this juriſdiction are famous for vaſt quantities of large and excellent olives, far exceeding the fineſt produced in Europe, being nearly, it is ſaid, the ſize of a hen's egg.

60 The audience of Charcas.

The audience of Charcas, the laſt diviſion of Peru, is equal in extent to that of Lima; but many of its parts are not ſo well inhabited, ſome being full of vaſt deſerts and impenetrable foreſts, while others have extenſive plains intercepted by the ſtupendous height of the Cordilleras: the country is inhabited only in ſuch parts as are free from thoſe inconveniences. It is bounded on the north by the dioceſe of Cuſco, and reaches ſouthward to Buenos Ayres; on the eaſt it extends to Braſil; and on the weſt it reaches to the Pacific ocean, particularly at Atacama. The remainder of the province borders on the kingdom of Chili.

61 Diviſions, &c. of this audience.

This audience is divided into the archbiſhopric of Plata, and five biſhoprics. We ſhall begin with the former.

The famous mountain of Potoſi is known all over the commercial world for the immenſe quantity of ſilver it has produced. The diſcovery of this amazing treaſure happened at the commencement of the year 1545, by a mere accident, which we ſhall mention afterwards. At a ſmall diſtance from it are the hot medicinal baths, called *Don Diego*, whither ſome reſort for health and others for amuſement.

62 How the country was at firſt ſettled by the Spaniards.

At the time when the firſt conqueſts were made, when emigrations were moſt frequent, the country of the Incas had a much greater reputation for riches than New Spain; and, in reality, for a long time much more conſiderable treaſures were brought away from it. The deſire of partaking of them muſt neceſſarily draw thither, as was really the caſe, a greater number of Caſtilians. Though almoſt all of them went over thither with the hope of returning to their country to enjoy the fortune they might acquire, yet the majority ſettled in the colony. They were induced to this by the ſoftneſs of the climate, the ſalubrity of the air, and the goodneſs of the proviſions. Mexico preſented not the ſame advantages, and did not give them reaſon to expect ſo much independence as a land infinitely more remote from the mother-country.

Cuſco attracted the conquerors in multitudes. They found this capital built on a ground that was very irregular, and divided into as many quarters as there were provinces in the empire. Each of the inhabitants might follow the uſages of his native country; but every body was obliged to conform to the worſhip eſtabliſhed by the founder of the monarchy. There was no edifice that had any grandeur, elegance, or convenience; becauſe the people were ignorant of the firſt elements of architecture. The magnificence of what they called the *palace of the ſovereign, of the princes of the blood*, and *of the great men of his empire*, conſiſted in the profuſion of the metals that were laviſhed in decorating them. The temple of the Sun was diſtinguiſhed above all other edifices; its walls were incruſted or ſheathed with gold and ſilver, ornamented with divers figures, and loaded with the idols of all the nations whom the Incas had enlightened and ſubdued.

As it was not a ſolicitude for their own preſervation which occupied the Spaniards at firſt, they had no ſooner pillaged the immenſe riches which had been amaſſed at Cuſco for four centuries, than they went in great numbers in 1534, under the order of Sebaſtian de Benalcazar, to undertake the deſtruction of Quito. The other towns and ſettlements of the empire were overrun with the ſame ſpirit of rapine; and the citizens and the temples were plundered in all parts.

Thoſe of the conquerors, who did not take up their reſidence in the ſettlements which they found already formed, built towns on the ſea coaſts, where before there were none: for the ſterility of the ſoil had not permitted the Peruvians to multiply much there; and they had not been induced to remove thither from the extremity of their country, becauſe they failed very little. Paita, Truxillo, Callao, Piſca, and Arica, were the roads which the Spaniards deemed moſt convenient for the communication they intended to eſtabliſh among themſelves and with the mother-country. The different poſitions of theſe new cities determined the degree of their proſperity.

Thoſe which were afterwards built in the inland parts of the country were not erected in regions which preſented a fertile ſoil, copious harveſts, excellent paſtures, a mild and ſalubrious climate, and all the conveniences of life. Theſe places, which had hitherto been ſo well cultivated by a numerous and flouriſhing people, were now totally diſregarded. Very ſoon they exhibited only a deplorable picture of a horrid deſert; and this wildneſs muſt have been more melancholy and hideous than the dreary aſpect of the earth before the origin of ſocieties. The traveller, who was led by accident or curioſity into theſe deſolate plains, could not forbear abhorring the barbarous and bloody authors of ſuch devaſtations, while he reflected that it was not owing even to the cruel illuſions of glory, and to the fanaticiſm of conqueſt, but to the ſtupid and abject deſire of gold, that they had ſacrificed ſo much more real treaſure, and ſo numerous a population.

This inſatiable thirſt of gold, which neither tended to ſubſiſtence, ſafety, nor policy, was the only motive for eſtabliſhing new ſettlements, ſome of which have been kept up, while ſeveral have decayed, and others have been formed in their ſtead. The fate of them all has correſponded with the diſcovery, progreſs, or declenſion of the mines to which they were ſubordinate.

Fewer errors have been committed in the means of procuring proviſions. The natives had hitherto lived hardly on any thing elſe but maize, fruits, and pulſe, for which they had uſed no other ſeaſoning except ſalt and pimento. Their liquors, which were made from different roots, were more diverſified: of theſe the chicha was the moſt uſual; but the conquerors were not ſatisfied either with the liquors or with the food of the people they had ſubdued. They imported vines from the Old World, which ſoon multiplied ſufficiently in the ſands of the coaſts at Ica, Piſca, Naſca, Moquequa, and Truxillo, to furniſh the colony with the wine and brandy it wanted. Olives ſucceeded ſtill better; and yielded a greater abundance of oil, which was much ſuperior to that of the mother-country. Other fruits were tranſplanted with the ſame ſucceſs. Sugar ſucceeds ſo well, that none of any other growth can be compared to that which is cultivated in thoſe parts, where it never rains. In the inland country wheat and barley 63 Manner of living of the natives.

barley

Peru. barley were fown; and at length all the European quadrupeds were foon found grazing at the foot of the mountains.

This was a confiderable ftep; but there ftill remained much more to be done. After they had provided for a better and a greater choice of fubfiftence, the next care of the Spaniards was to have a drefs more commodious and more agreeable than that of the Peruvians. Thefe were, however, better clothed than any other American nation. They owed this fuperiority to the advantage which they alone poffeffed, of having the LLAMA and PACOS, domeftic animals which ferved them for this ufe. See CAMELUS, MAMMALIA *Index*.

After the conqueft, all the Indians were obliged to wear clothes. As the oppreffion under which they groaned did not allow them to exercife their former induftry, they contented themfelves with the coarfer cloths of Europe, for which they were made to pay an exorbitant price. When the gold and filver which had efcaped the rapacity of the conquerors were exhaufted, they thought of re-eftablifhing their national manufactures. Thefe were fome time after prohibited, on account of the deficiency which they occafioned in the exports of the mother country. The impoffibility which the Peruvians found of purchafing foreign ftuffs and paying their taxes, occafioned permiffion to be given at the end of ten years for their re-eftablifhment. They have not been difcontinued fince that time; and have been brought to as great a degree of perfection as it was poffible they could be under a continual tyranny.

64
Manufactures, &c. With the wool of the vicuna, a fpecies of wild pacos, they make, at Cuzco, and in its territory, ftockings, handkerchiefs, and fcarfs. Thefe manufactures would have been multiplied, if the fpirit of deftruction had not fallen on animals as well as on men. The fame wool, mixed with that of the fheep imported thither from Europe, which have exceedingly degenerated, ferves for carpets, and makes alfo tolerably fine cloth. Fleeces of inferior quality are employed in ferges, druggets, and in all kinds of coarfe ftuffs.

The manufactures fubfervient to luxury are eftablifhed at Arequipa, Cufco, and Lima. In thefe three towns is made a prodigious number of gold toys and plate, for the ufe of private perfons, and alfo for the churches. All thefe manufactures are but coarfely wrought, and mixed with a great deal of copper. We feldom difcover more tafte in their gold and filver laces and embroideries which their manufactures alfo produce. This is not altogether the cafe in regard to their lace, which, when mixed with that of Europe, looks very beautiful. This laft manufacture is commonly in the hands of the nuns, who employ in it the Peruvian girls, and the young Meftees of the towns, who for the moft part before marriage pafs fome years in the convent.

Other hands are employed in painting and gilding leather for rooms, in making with wood and ivory pieces of inlaid work and fculpture, and in drawing figures on the marble that is found at Cucuca, or on linen imported from Europe. Thefe different works, which are almoft all manufactured at Cufco, ferve for ornaments for houfes, palaces, and temples: the drawing of them is not bad, but the colours are neither exact nor permanent. If the Indians, who invent nothing, but are excellent imitators, had able mafters and excellent models, they would at leaft make good copyifts. At the clofe of the laft century, fome works of a Peruvian painter, named *Michael de St Jacques*, were brought to Rome; and the connoiffeurs difcovered marks of genius in them.

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Of the mines of gold and filver. Though the Peruvians were unacquainted with coin, they knew the ufe of gold and filver; for they employed them in different kinds of ornaments. Independent of what the torrents and accident procured them of thefe metals, fome mines had been opened of little depth. The Spaniards have not tranfmitted to us the manner in which thefe rich productions were drawn from the bofom of the earth. Their pride, which has deprived us of fo much ufeful knowledge, undoubtedly made them think, that, in the inventions of a people whom they called *barbarous*, there was nothing that was worthy to be recorded.

The difference as to the manner in which the Peruvians worked their mines, did not extend to the mines themfelves. The conquerors opened them on all fides. At firft the gold mines tempted the avarice of the greater number. Fatal experience difcouraged thofe whom paffion had not blinded. They clearly faw, that, for fome enormous fortunes raifed in this manner, great numbers, who had only moderate fortunes, were totally ruined. Thefe mines funk into fuch difcredit, that, in order to prevent them from being abandoned, the government was obliged to take the 20th part of their produce, inftead of the fifth which it at firft received.

The mines of filver were more common, more equal, and richer. They even produced filver of a fingular fpecies, rarely found elfewhere. Towards the feacoaft, great lumps of this metal are found in the fands.

There are a great number of other mines which are infinitely more important, and are found in the rocks and on the mountains. Several of them gave falfe hopes. Such, in particular, was that of Ucuntaya, difcovered in 1713. This was only an incruftation of almoft maffive filver, which at firft yielded feveral millions, but was foon exhaufted.

Others which were deeper have been alike deferted. Their produce, though equal to what it was originally, was not fufficient to fupport the expence of working them, which augmented every day. The mines of Quito, Cufco, and Arequipa, have experienced that revolution which awaits many of the reft.

There are greater numbers of very rich mines which the waters have invaded. The difpofition of the ground, which from the fummit of the Cordilleras goes continually fhelving to the South fea, muft neceffarily render thefe events more common at Peru than in other places. This inconvenience, which with greater care and fkill might often have been prevented or diminifhed, has been in fome inftances remedied.

Jofeph Salcedo, about the year 1660, had difcovered, not far from the town of Puna, the mine of Laycacota. It was fo rich, that they often cut the filver with a chifel. Profperity had fo elevated the mind of the proprietor, that he permitted all the Spaniards who came to feek their fortune in this part of the New World, to work fome days on their own account, without weighing or taking any account of the prefents he made them. This generofity drew around him an infinite number of

 people,

people, whofe avidity made them quarrel with each other, and the love of money made them take up arms and fall upon one another; and their benefactor, who had neglected no expedient to prevent and extinguifh their fanguinary contentions, was hanged as being the author of them. Whilft he was in prifon, the water got poffeffion of his mine. Superftition foon made it imagined that this was a punifhment for the horrid act they had perpetrated againft him. This idea of divine vengeance was revered for a long time; but at laft, in 1740, Diego de Baena affociated with other opulent people to avert the fprings which had deluged fo much treafure. The labours which this difficult undertaking required, were not finifhed till 1754. The mine yields as much now as it did at firft. But mines ftill richer than this have been difcovered. Such, for example, is that of Potofi, which was found in the fame country where the Incas worked that of Porco.

An Indian, named *Hualpa*, in 1545, purfuing fome deer, in order to climb certain fteep rocks laid hold of a bufh, the roots of which loofened from the earth, and brought to view an ingot of filver. The Indian had recourfe to it for his own ufe; and never failed to return to his treafure every time that his wants or his defires folicited him to it. The change that had happened in his fortune was remarked by one of his countrymen, and he difcovered to him the fecret. The two friends could not keep their counfel and enjoy their good fortune. They quarrelled; on which the indifcreet confidant difcovered the whole to his mafter, Villaroell, a Spaniard who was fettled in the neighbourhood. Upon this the mine became known, and was worked; and a great number of them were found in his vicinity; the principal of which are in the northern part of the mountain, and their direction is from north to fouth. The moft intelligent people of Peru have obferved, that this is in general the direction of the richeft mines.

The fame of what was paffing at Potofi foon fpread abroad; and there was quickly built at the foot of the mountain a town, confifting of 60,000 Indians and 10,000 Spaniards. The fterility of the foil did not prevent its being immediately peopled. Corn, fruit, flocks, American ftuffs, European luxuries, arrived there from every quarter. Induftry, which everywhere follows the current of money, could not fearch for it with fo much fuccefs as at its fource. It evidently appeared that in 1738 thefe mines produced annually near 978,000l. without reckoning the filver which was not regiftered, and what had been carried off by fraud. From that time the produce has been fo much diminifhed, that no more than one-eighth part of the coin which was formerly ftruck is now made.

At the mines of Potofi, and all the mines of South America, the Spaniards, in purifying their gold and filver, ufed mercury, with which they are fupplied from Guança Velica. The common opinion is, that this mine was difcovered in 1564. The trade of mercury was then ftill free: it became an exclufive trade in 1571. At this period all the mines of mercury were fhut; and that of Guança Velica alone was worked, the property of which the king referved to himfelf. It is now found to diminifh. This mine is dug in a prodigioufly large mountain, 60 leagues from Lima. In its profound abyfs are feen ftreets, fquares, and a chapel, where the myfteries of religion on all feftivals are celebrated. Millions of flambeaux are continually kept to enlighten it.

Private people at their own expence work the mine of Guança Velica. They are obliged to deliver to government, at a ftipulated price, all the mercury they extract from it. As foon as they have procured the quantity which the demands of one year require, the work is fufpended. Part of the mercury is fold on the fpot, and the reft is fent to the royal magazines throughout all Peru; from whence it is delivered out at the fame price it is fold for in Mexico. This arrangement, which has occafioned many of the mines to drop, and prevented others from being opened, is inexcufable in the Spanifh fyftem. The court of Madrid, in this refpect, merits the fame reproaches as a miniftry in other countries would incur, that would be blind enough to lay a duty on the implements of agriculture.

The mine of Guança Velica generally affects thofe who work in it with convulfions: this and the other mines, which are not lefs unhealthy, are all worked by the Peruvians. Thefe unfortunate victims of an infatiable avarice are crowded together and plunged naked into thefe abyffes, the greateft part of which are deep, and all exceffively cold. Tyranny has invented this refinement in cruelty, to render it impoffible for any thing to efcape its reftlefs vigilance. If there are any wretches who long furvive fuch barbarity, it is the ufe of cocoa that preferves them.

In the Cordilleras, near the city of Paz, is a mountain of remarkable height, called *Illimani*, which doubtlefs contains immenfe riches; for a crag of it being fome years ago fevered by a flafh of lightning, and falling on a neighbouring mountain, fuch a quantity of gold was found in the fragments, that for fome time that metal was fold at Paz for eight pieces of eight *per* ounce; but its fummit being perpetually covered with ice and fnow, no mine has been opened in the mountain.

The city of La Paz is of a middling fize, and from its fituation among the breaches of the Cordilleras, the ground on which it ftands is unequal, and it is alfo furrounded by mountains. When the river Titicaca is increafed, either by the rains, or the melting of the fnow on the mountains, its current forces along large maffes of rocks with fome grains of gold, which are found after the flood has fubfided. Hence fome idea may be formed of the riches inclofed in the bowels of thefe mountains; a remarkable proof of which appeared in the year 1730, when an Indian wafhing his feet in the river, difcovered fo large a lump of gold, that the marquis de Caftel Fuerte gave twelve thoufand pieces of eight for it, and fent it as a prefent to the king of Spain.

In a period of ten years, the Peruvian mines, without including thofe of Quito and Buenos Ayres, yielded 35,359 marks of gold, 22 carats fine, and 3,739,763 marks of filver. This has been eftimated at 7,703,545l. fterling. The above period is included between the years 1780 and 1790.

Balfam of PERU. See MYROXILON, BOTANY and MATERIA MEDICA *Index*.

PERUGIA, a town of Italy, in the pope's territories, and capital of Perugino. It is an ancient, handfome, populous, and large city, with a ftrong citadel, an univerfity, and a bifhop's fee. The churches, and many

many other buildings, as well public as private, are very handfome. It is feated on a hill, in E. Long. 12. 20. N. Lat. 43. 6.

PERUGINO, a province of Italy, in the territory of the church, bounded on the weft by Tufcany, on the fouth by Orvietano, on the eaft by the duchies of Spoleto and Urbino, and on the north by the county of Citta Caftellana. It is one of the fmalleft provinces in the territory of the church. The air is very pure, and the foil fertile in corn and good wine; befides, the lake Perugia fupplies them with plenty of fifh. The capital town is Perugia. The lake is eight miles from the city, and is almoft round, being about five miles in diameter; in it there are three iflands. This province is about 25 miles in length, and near as much in breadth.

PERUGINO. See MONTANINI.

PERUKE. See PERRUKE.

PERUVIAN BARK. See CINCHONA, and *JESUITS Bark*, MATERIA MEDICA *Index*.

PERUVIANA, a general name given to that vaft peninfula, extending itfelf from the ifthmus of Darien to Cape Horn, in the form of a triangle, of which the *Terra Magellanica* and the cape form the vertex. It includes the whole of South America, although, as is well known, all the countries included within thefe limits do not acknowledge the dominion of the crown of Spain. See *TERRA Firma*.

PESARO, a town of Italy, in the territory of the pope, and duchy of Urbino, with a bifhop's fee. It is a large place, whofe ftreets are paved with bricks. The caftle is very well fortified, the harbour excellent, and the cathedral church magnificent. The environs are remarkable for producing good figs, of which they fend large quantities to Venice. It is feated on an eminence at the mouth of the river Fogha, on the gulf of Venice. E. Long. 13. 0. N. Lat. 43. 56.

PESCARA, a very ftrong town in the kingdom of Naples, and in the Hither Abruzzo; feated at the mouth of a river of the fame name, which falls into the gulf of Venice. E. Long. 15. 2. N. Lat. 42. 27.

PESCENIUS NIGER. See NIGER.

PESCHIERA, a fmall but ftrong town of Italy, in the Veronefe, with a caftle and a ftrong fort; feated on the river Mincio or Menzo, which proceeds from the lake Garda. E. Long. 11. 4. N. Lat. 42. 27.

PESENAS, an ancient town of France, in Languedoc, and in the diocefe of Agde; delightfully feated on the river Pein, 12 miles north-eaft of Beffeirs, and eight north of Agde. E. Long. 3. 34. N. Lat. 43. 28.

PESSARY, in *Medicine*, a folid fubftance compofed of wool, lint, or linen, mixed with powder, oil, wax, &c. made round and long like a finger, in order to be introduced into the exterior neck of the matrix, for the cure of feveral uterine diforders.

PEST, a town of Upper Hungary, and capital of a county of the fame name, feated on the Danube, in a fine plain over-againft Buda, 85 miles fouth eaft of Prefburg. E. Long. 18. 25. N. Lat. 47. 24.

PESTILENCE, in *Medicine*, the fame with the PLAGUE.

PETAGUEL, a territory of South America, in Brafil, bounded on the north by Dele; on the eaft by the fea; on the fouth by the captainfhip of Rio-Grande; and on the weft by Tupuya. It contains mines of filver.

PETAL, in *Botany*, one of the coloured leaves which compofe the flower.

PETALISM, a mode of deciding on the guilt of citizens, fimilar to the Athenian OSTRACISM. It was introduced in Syracufe about the year before Chrift 460, in order to prevent the tyranny of the richer citizens, who had often about that time aimed at the diadem. To prevent, therefore, the evils daily arifing from thence, and to bring down the afpiring minds of the wealthy citizens, the Syracufans were forced to make a law not unlike that of the Athenian oftracifm; for as at Athens every citizen was to write on a fhell the name of the perfon whom they conceived to be the moft likely, on account of his wealth and adherents, to afpire to the crown; fo at Syracufe they were to write on a leaf the names of fuch as they apprehended powerful enough to ufurp the fovereignty. When the leaves were counted, he who had the moft fuffrages againft him was, without any further inquiry, banifhed for five years. This new-contrived method of impairing the eftates, and weakening the intereft of the overgrown citizens, was called *petalifm*, from the Greek word *petalon*, which fignifies "a leaf." This law was attended with many evil confequences; for thofe who were moft capable of governing the commonwealth were driven out, and the adminiftration of public affairs committed to the meaneft of the people; nay, many of the chief citizens, who were able to render their country great fervice, fearing to fall under penalties of this law, withdrew from the city, and lived private in the country, not concerning themfelves with public affairs: whence all the employments being filled with men of no merit or experience, the republic was on the brink of ruin, and ready to fall into a ftate of anarchy and confufion. The law therefore of petalifm, upon more mature deliberation, was repealed foon after it had been firft enacted, and the reins of government were again put into the hands of men who knew how to manage them.

PETARD, in the art of war. See GUNNERY.

PETAU, DENIS, or *Dionyfius PETAVIUS*, a French Jefuit of great erudition, was born at Orleans in 1583. His father was a man of literature, and obferving ftrong parts and an excellent genius for letters in his fon, he took every means in his power to improve them. He ufed to tell his fon, that he ought to qualify himfelf fo, as to be able to attack and confound "the giant of the Allophylæ;" meaning that moft eminent fcholar Jofeph Scaliger, whofe abilities and learning were allowed to have done great honour and much fervice to the reformed. Young Petavius feems to have entered readily into his father's views; for he ftudied moft intenfely, and afterwards levelled much of his erudition againft Scaliger. He joined the ftudy of the mathematics to that of the belles lettres; and afterwards applied himfelf to a courfe of philofophy, which he began in the college of Orleans, and finifhed at Paris. He afterwards maintained thefes in Greek, which was as familiar to him as Latin; and the Latin, it is faid, he underftood better than he did his own native language. When he was pretty well advanced, he had free accefs to the king's library, which he often vifited on account of the Latin and Greek manufcripts. Among other advantages which accompanied his literary purfuits, was the friendfhip of Ifaac Cafaubon, whom Henry IV. called to Paris in 1600. It was at Cafaubon's inftigation, that Petavius, though then

but

Petau ‖ Petcheli.

but very young, undertook an edition of The Works of Synesius. In this edition he corrected the Greek from the manuscripts, translated that part which yet remained to be translated into Latin, and wrote notes upon the whole. He was but 19 years of age when he was made professor of philosophy in the university of Bourges; and he spent the two following years in studying the ancient philosophers and mathematicians. In 1604, when Morel, professor of Greek at Paris, published The Works of Chrysostom, some part of Petavius's labours on Synesius were added to them: from the title of which we learn, that he then took the name of *Pœtus*, which he afterwards changed into *Petavius*. His own edition of The Works of Synesius did not appear till 1612.

He entered into the society of the Jesuits in 1605, and did great credit to it by his vast and profound erudition. He became a zealous advocate for the church of Rome; and there was no way of serving it more agreeable to him than that of criticising and abusing its adversaries. He was most bitter against Scaliger; nor did he even spare his friend Casaubon whenever he came in his way.—Petavius excelled particularly in the dark science of chronology; the learned world in general being obliged to him for some exact and nice disquisitions on this subject. His chief work, which is in great repute to this day, he intitled, *Rationarium Temporum*. It is an abridgement of universal history, from the earliest times to 1632, in chronological order, with references to proper authorities. It was improved, and several additions made to it, by Perizonius, and others after his death. This eminent father, after a very laborious life, died at Paris in the end of the year 1652, aged 69. Gassendus, in his life of Pereschius, says he was the most consummate scholar the Jesuits ever had; an opinion very likely to be true, when we consider that he often contended successfully with Scaliger, Salmasius, and others, whose abilities have been universally acknowledged. His judgment, however, was not equal to his erudition, and his controversial writings are full of sourness and spleen. We have the following character of a great work of Petavius by an author of much celebrity, but who perhaps is as much biassed on the side of infidelity as he thinks this learned Jesuit was in favour of the church of Rome. The *Dogmata Theologica* of Petavius are a work of incredible labour and compass: the volumes which relate solely to the incarnation (two folios, 5th and 6th, of 837 pages) are divided into 16 books—the first of his history, the remainder of controversy and doctrine. The Jesuit's learning is copious and correct: his Latinity is pure, his method clear, his argument profound and well connected; but he is the slave of the fathers, the scourge of heretics, and the enemy of truth and candour, as often as they are inimical to the Catholic cause.

PETAW, an ancient town of Germany, in the circle of Austria, and in Stiria. It is a handsome place, and is seated on the river Drave, 35 miles north-east of Cilley, and 109 south of Vienna. E. Long. 15. 36. N. Lat. 46. 40.

PETCHELI, a province of Asia, in China, and the chief in the whole empire; bounded on the east by the sea, on the north by the great wall, on the west by Chansi, and on the south by Chantong and Honan. "This province contains nine cities of the first class, which have several others under their jurisdiction; these are about 40 in number, less considerable indeed, but all surrounded with walls and ditches. Petcheli has few mountains. Its soil is sandy, and produces very little rice; but all other kinds of grain abound there, as well as the greater part of the fruit-trees we have in Europe. It pays an annual tribute to the emperor, which, according to Father Martini, consists of 601,153 bags of rice, wheat, and millet; 224 pounds of linseed; 45,135 of spun silk; 13,748 of cotton; 8,737,248 trusses of straw for the horses belonging to the court, and 180,870 measures of salt, each containing 124 pounds; which is proportionally much inferior to that paid by other provinces. The population of this province is estimated at 38,000,000.

Petcheli.

"It is remarked that the people of this province have not the same aptitude for acquiring the sciences as those who inhabit the southern provinces of the empire; but they are more robust and warlike; and better calculated to endure the hardships and fatigue of war. This is the case with the Chinese of all the other northern countries.

"The face of the country here being flat and level, permits the use of a kind of carriage, the construction of which appears to be rather singular. Father Martini, one of the first missionaries in China, thus describes it: 'They use, in the province of Petcheli, a kind of chariot with one wheel, and constructed in such a manner, that there is room in the middle for only one person, who sits as if on horseback; the driver pushes behind, and, by means of wooden levers, makes the chariot advance with safety and expedition.' This has perhaps given rise to the report of chariots driven in that country by the wind, which the Chinese direct over land with sails, as they do ships at sea. A French missionary, who traversed this province in 1768, seems to have made use of the same kind of carriage. 'We quitted the canal (says he) to travel in carts, which is customary in this part of China; but it is disagreeable beyond description. The cart is amazingly clumsy, and has a great resemblance to the carriage of a gun: there is room in it for only one person, who is frequently obliged to sit cross-legged, as our taylors do in Europe; it jolts prodigiously; and, while the traveller is exposed to the scorching rays of the sun, such clouds of dust sometimes arise as almost suffocate him.'

"The temperature of the air of this province does not seem to agree with its latitude. Although Petcheli extends no farther than to the 42d degree of north latitude, yet all the rivers there are so much frozen during four months in the year, that horses and waggons with the heaviest loads may safely pass them. It deserves to be remarked, that the whole body of ice is formed in one day, and that several are necessary to thaw only the surface. What may appear no less extraordinary is, that during these severe frosts one does not feel that sharp and pinching cold which accompanies the production of ice in Europe. These phenomena cannot be accounted for, but by attributing them to the great quantity of nitre which is found dispersed throughout this province, and to the serenity of the sky, which, even during winter, is seldom obscured by a cloud. The physical explanation, which we have given of this singular temperature, is fully confirmed by experiments lately made by Father Amiot at Peking, which convinced him, that in this capital and neighbourhood, as far as seven or eight

Petcheli. eight leagues round, the water, air, and earth, equally abound with nitre.

"With regard to the water, the facility with which it freezes, the solidity of the ice and its duration, evidently announce the presence of nitre. A tub filled with water, placed near one of Reaumur's thermometers, had its surface immediately frozen, when the mercury stood only one degree above the freezing point; and when it stood three degrees below freezing, the water became a solid mass of ice, if the diameter of the vessel did not exceed a foot and a half, and the depth of the water four or five inches. This water, when the weather was fine, continued in the same state of congelation as long as the mercury in the thermometer did not rise higher than three degrees above 0; when the mercury rose higher, it then began to dissolve, but so slowly, that two or three days were scarcely sufficient to restore it to its former fluidity." Grosier goes on to relate other experiments of Father Amiot, which were made with a view to discover the cause of the water's freezing so in this temperate climate; and he then proceeds to tell us, that "if the waters of the province of Petcheli contain much nitre, it is no less certain, that the air which one breathes there is abundantly impregnated with it. The following are indubitable proofs of it: 1st, Notwithstanding unwholesome food, such as the flesh of the greater part of domestic animals that have died of old age or disease, which the people of this province greedily devour, notwithstanding filth and all the inconveniences resulting from low, damp, and confined lodgings, where all the individuals of the same family are, as it were, heaped one upon another, the plague never makes its appearance in Petcheli; and the people are seldom attacked by any of those epidemical distempers which are so common in Europe. 2dly, Provisions of every kind may be kept at Peking a long while, without being subject to corruption. Raisins are eaten there fresh even in May, apples and pears till midsummer; wild boars, stags, deer, roebucks, rabbits, hares, pheasants, ducks, geese, and all kinds of game, brought from Tartary to Peking after the commencement of winter; fish of every species, transported from the rivers of Leatong, will keep without the assistance of salt, in their state of congelation, for two or three months, although they are exposed every day in the markets, carried from the markets to private houses, and from private houses brought back to the markets until they are all sold, which does not happen before the end of March. It is certain that these facts announce an antiseptic quality in the air, which must undoubtedly proceed from the great quantity of nitre contained in it.

"3dly, The earth which forms the soil of Petcheli abounds no less with nitre; whole fields may be seen in the neighbourhood of Peking which are covered with it. Every morning at sunrise, the country in certain cantons appears white as if sprinkled by a gentle fall of snow. If a quantity of this substance be swept together, a great deal of kien, nitre, and salt, may be extracted from it. The Chinese pretend that this salt may be substituted for common salt; however this may be, it is certain, that, in the extremity of the province towards Sinen-hoa-fou, poor people, and the greater part of the peasants, make use of no other. With regard to the kien procured from the earth, they use it for washing linen as we do soap. Although the land of Petcheli be replete with nitrous particles, it does not, however, form dry deserts; it is cultivated with care, and becomes fruitful by incessant labour. The earth is frozen in winter to the depth of two or three feet, and does not become soft before the end of March. This may sufficiently explain why the frost kills plants in the neighbourhood of Pekin, which Linnæus raised in Sweden, although it is 20 degrees farther north than the capital of the Chinese empire.

Petcheli ‖ Peter.

PETECHIÆ, in *Medicine*, a name given to those spots, whether red or of any other colour, which appear in malignant fevers.

PETELIA. See STRONGOLI.

PETER, ST, the apostle, born at Bethsaida, was son of John, Jona, or Joana, and brother of St Andrew (John i. 42, 43.). His first name was Simon or Simeon; but when our Saviour called him to the apostleship, he changed his name into Cephas, that is, in Syriac, a *stone* or a *rock*; in Latin *petra*, whence *Peter*. He was a married man; and had his house, his mother-in-law, and his wife, at Capernaum upon the lake of Gennesareth (Mark i. 29. Matth. viii. 14. Luke iv. 38.). St Andrew having been first called by Jesus Christ, met his brother Simon, and told him (John i. 41.) we have found the Messiah, and then brought him to Jesus. Jesus beholding him, said to him, You are Simon son of Jona; henceforth you shall be called *Cephas*, that is, *stone* or *rock*. After having passed one day with our Saviour, they returned to their ordinary occupation, which was fishing. Yet it is thought they were present with him at the marriage of Cana in Galilee. This happened in the 30th year of the vulgar Christian era.

Towards the end of the same year, Jesus Christ being on the shore of the lake of Gennesareth, saw Peter and Andrew busy about their fishery, and washing their nets, (Luke v. 1, 2, 3.). He entered into their boat, and bid Peter throw out his nets into the sea, in order to fish. Peter obeyed him, though he had already fished the whole night without catching any thing. They took so many fishes at this draught, that their own vessel, and that of James and John, sons of Zebedee, were filled with them. Then Peter threw himself at the feet of Jesus, and said to him, Depart from me, Lord, for I am a sinner. Then Jesus said to them, Follow me, and I will make you fishers of men. He said the same thing to James and John; and immediately they quitted their boats and nets, and followed our Saviour.

Some time after, Jesus coming to Capernaum entered into the house of St Peter, where his mother-in-law lay sick of a fever. He immediately healed her, and she began to minister to him (Luke iv. 38. and Matt. viii. 14.). A little while before the feast of the passover of the following year, being the 32d of the vulgar era, after Jesus returned into Galilee, he made choice of twelve apostles, among which St Peter has always the first place (Matt. x. 2. Luke vi. 13.). One night that Jesus Christ walked upon the waters of the lake of Gennesareth, St Peter asked him leave to come and meet him (Matt. xiv. 28, 29.). Jesus gave him leave; but he seeing a great wave coming, was afraid, and therefore began to sink. Then Jesus held him up, and said, O man of little faith, why was you afraid? Af-

terwards

Peter. terwards landing on the other ſide of the lake, and the multitude that he had fed the day before beyond the lake being come to him at Capernaum, he ſpoke to them of his body and of his blood which he was to give to his diſciples to eat and drink. This ſo offended the multitude, that ſeveral of them quitted him thereupon. He therefore aſked his apoſtles if they alſo would leave him; to which Peter replied, To whom ſhall we go, Lord; for thou haſt the words of eternal life (John vi. 53, 54, &c.). One day, as our Saviour was near Cæſarea Philippi, he aſked his apoſtles whom the world took him for? they anſwered, that ſome ſaid he was John the Baptiſt; others, Elias; and others Jeremiah, or one of the prophets. But whom do you ſay I am? ſays Jeſus Chriſt. Simon Peter anſwered, Thou art Chriſt, the ſon of the living God. Jeſus then ſaid unto Peter, Bleſſed art thou, Simon Barjona; for fleſh and blood hath not revealed it unto thee, but my father which is in heaven (Mat. xvi. 13, 14, &c.). And I ſay unto thee, that, as thou art Peter, ſo upon this rock will I build my church, and the gates of hell ſhall not prevail againſt it; and I will give unto thee the keys of the kingdom of heaven, and whatſoever thou ſhalt bind on earth ſhall be bound in heaven, and whatſoever thou ſhalt looſe upon earth ſhall be looſed in heaven. About ſix or eight days after this, our Saviour taking Peter, James, and John, up a high mountain, apart from the other diſciples, ſhowed them a glimpſe of his glory, and was transfigured before them (Mat. xvii. 1, 2, &c. and Luke ix. 28.). Whereupon Peter, ſeeing Moſes and Elias together with Jeſus, cried out to them in an ecſtacy, Lord, it is good for us to be here! if you pleaſe, we will make three tents; one for you, one for Moſes, and one for Elias.

Jeſus returning from thence to Capernaum, thoſe who gathered the tribute-money came to Peter, and ſaid, Does not your maſter pay tribute? Whereupon Jeſus ordered Peter to throw his line into the ſea, and that he ſhould find wherewith to pay the toll for them two in the mouth of the firſt fiſh he ſhould take. Peter obeyed; and finding a piece of money in the mouth of the fiſh, he gave it to the tribute-gatherers, as he was directed. One day, as Jeſus was diſcourſing concerning the forgiveneſs of injuries (Mat. xviii. 21, 22.), St Peter aſked him, how often they muſt forgive, and whether it was ſufficient to pardon an offender ſeven times? Jeſus told him, I ſay, you muſt pardon not only as far as ſeven times, but even ſeventy-times ſeven. Upon another occaſion (Mat. xix. 27—29.), as our Saviour was ſpeaking of the danger of riches, Peter ſaid to him, Lord, we have left all things to follow thee; what reward ſhall we have for it? Jeſus anſwered him, I tell you in truth, that you who have left all things to follow me ſhall receive an hundred fold even in this world, and in the other eternal life; and at the laſt day, when the Son of man ſhall come to judge the world, you ſhall ſit upon twelve thrones to judge the twelve tribes of Iſrael.

On the Tueſday before our Saviour's paſſion, Peter ſhowed him the fig-tree he had curſed the evening before, which was now dried up and withered (Mark xi. 12—21.); and the day following, as they ſat upon the mountain of Olives, he, with the other apoſtles, aſked Jeſus when the temple was to be deſtroyed (Mat. xxiv. 1, 2, &c. Mark xiii. 1, 2, &c. Luke xxii.). On Thurſday he was ſent with St John to prepare all things for the paſſover; and at evening, when Jeſus was come into the city with his apoſtles, and being ſat down at table, began to ſpeak of him that ſhould betray him, Peter made ſigns to John to aſk him who this ſhould be (John xiii. 24.). After ſupper, the diſciples entered into diſpute which ſhould be the greateſt among them: whereupon Jeſus Chriſt, laying aſide his garments, betook himſelf to waſh their feet, to give them an example of humility in his own perſon. St Peter at firſt made ſome difficulty, and would not ſuffer his maſter to waſh his feet: but Jeſus telling him, that if he did not waſh his feet, he could have no part in him; St Peter replied, Lord, waſh not only my feet, but my hands and head alſo (John xiii. 6—10.).

Some time after, Jeſus ſaid to him (Luke xxii. 31, 32, &c.), Peter, Satan has deſired to ſift you as men ſift wheat; but I have prayed for you, that your faith may not fail: and when you are converted, confirm your brethren. By this he warned St Peter of his fall, that was juſt at hand, and of his renouncing him; from which, by the aſſiſtance of God, he was afterwards to recover. St Peter then aſked him, where he was going? and ſaid, he was ready to follow him every where, not only to priſon, but to death itſelf. But Chriſt declared to him, that he would be ſo far from following him to death that he would abjure him three times that very night before the cock ſhould crow, or before break of day. When ſupper was ended, he went to the garden of Olives, where, taking Peter, James, and John, he went with them apart, that they might be witneſſes of his agony. Peter, though before he had ſhowed ſo much reſolution, yet fell aſleep with the reſt; which occaſioned Jeſus to ſay to him, Do you ſleep, Simon? Could you not watch with me one hour? (Mark xiv. 37. Mat. xxvi. 40, &c.).

Judas being come with the ſoldiers to ſeize Jeſus, Peter drew his ſword, and cut off the right ear of one called Malchus, who was ſervant to the high-prieſt: but Jeſus bid him put up his ſword into the ſcabbard, and told him, that all thoſe who fought with the ſword ſhould periſh by the ſword: and at the ſame time healed Malchus's ear (John xviii. 10, &c.). Peter followed Jeſus afar off, as far as the houſe of Caiaphas, and was let in by means of another diſciple, who was known in the family. The ſoldiers and ſervants that had brought Jeſus, having lighted a fire in the middle of the hall, Peter mingled among them to warm himſelf alſo; when a maid-ſervant, having looked earneſtly upon him, ſaid, Surely this man was with Jeſus of Nazareth. But Peter made anſwer, I know not what you ſay, for I do not ſo much as know the man. Preſently after he went out into the porch, when immediately the cock crew. A little while after another maid ſaid to thoſe that were preſent, This man was with Jeſus of Nazareth. But Peter denied it with an oath. About an hour after, one of the company affirmed that Peter was a diſciple of Jeſus. Others inſiſted upon the ſame thing; and ſaid, that ſurely he was one of them, for his very ſpeech betrayed him to be a Galilean. Laſtly, one of them, being a kinſman of Malchus whoſe ear Peter had cut off, affirmed the ſame thing; and aſked him, Did not I ſee you with him in the garden? Peter again denied it with an oath, proteſting that he did not know the man. And at the ſame time the cock crowed the ſecond time.

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time. Then Jesus, being in the same hall, and not far from Peter, looked upon him; and Peter then remembering what Jesus had said to him, that before cock-crow he should deny him thrice, he went out of Caiaphas's house, and wept bitterly (Mat. xxvi. 73, 75. Mark xiv. 34, 72.).

Very probably he remained in secret, and in tears, all the time of our Saviour's passion, that is, all Friday and Saturday following; but on Sunday morning, Jesus being risen, and Mary having been at the tomb, and not finding the body of Jesus, she came in haste into the city, to tell Peter and John that they had taken away their master, and that she could not find where they had put him. Peter and John made haste thither, and John coming first, did not go into the sepulchre. Peter then coming up to him, presently stooped down, and saw the linen clothes wherein the body had been wrapt. He went then into the sepulchre, and John with him; after which they returned to Jerusalem, not knowing what had come to pass. But soon after Jesus appeared to the holy women, who had come first to the sepulchre, and bid them give his apostles notice of his resurrection. And the same day our Saviour also appeared to Peter, to comfort him, and assure him that his repentance had been acceptable to him.

Some days after, St Peter being returned into Galilee as Jesus had commanded him, and going to fish in the sea of Galilee, or in the lake of Gennesareth, with some other of the apostles, Jesus appeared to them on the shore, and bid them throw out their nets on the right side of the vessel. They threw them out, and took such a multitude of fishes that they could not draw up their nets again. Then St John said to Peter, It is the Lord. Peter immediately girded up himself, for he was naked, and swimming to shore he came to Jesus: then drawing their nets to shore, Jesus dined with them. After dinner, Jesus, said to Peter, Simon, son of Jona, do you love me more than these? He answered, Yea, Lord, you know that I love you. Jesus says to him, Then feed my lambs. He put the same question to him again; and Peter making the same answer, our Lord said to him again, Feed my sheep. This he repeated a third time; at which St Peter was troubled, and said, You know, Lord, that I love you. Jesus replied to him, "Feed my sheep. I tell you for a truth, that when you were young, you girded yourself, and went where you pleased; but now you are old, another shall gird you, and lead you where you would not go." This he said to let him know what death he was to die. At the same time, Peter seeing St John the Evangelist, said to our Saviour, Lord, what must become of him? Jesus answered, "If I will that he tarry till I come, what does that concern you? Do you follow me." Thus he refused to declare in what manner St John should end his life.

After that Jesus Christ had ascended into heaven, and that the apostles had been witnesses of his ascension, they returned to Jerusalem, to wait there for the Holy Ghost, whom our Saviour had promised to send them; and being assembled together in a house, they continued there in prayer, and in the union of charity, till the time that the Holy Ghost descended upon them, in the form of tongues of fire. During this interval, St Peter proposed to the apostles, and to the rest of the assembly, to fill up the place that the traitor Judas had left vacant in the apostleship. The proposal was agreed to by all; and two persons were proposed, Joseph Barsabas and Matthias: upon this last the lot fell; and from that time he was admitted one of the apostles. The tenth day after the ascension of our Saviour, being the day of Pentecost, the Holy Ghost having descended upon the apostles, and upon all the faithful that were assembled with them, and having replenished them with supernatural gifts, and especially with the gift of tongues, all those who were witnesses of this miracle expressed their admiration at it; and there being upon that day at Jerusalem a great many Jews from several provinces of the east, they could not comprehend by what means these men, who were Galileans, should speak the languages of all these pagan nations (Acts ii. 1, 2, &c.). Some of them said, that the apostles were full of new wine. But St Peter standing up, told them, that what they heard and saw was not the effect of drunkenness, but was the completion of the promise that the Holy Ghost had made by the prophet Joel (ii. 28.), to send his spirit upon all flesh, and to give the spirit of prophecy to young and old, to men and women. He afterwards spoke to them of Jesus Christ, and told them that he was the true Messiah, that he was risen from the dead as the scripture had foretold he should; declaring that himself and the other apostles were witnesses of his resurrection, of his ascension into heaven, and of the mission of the Holy Ghost, the visible effects of which they saw with their own eyes in the gifts of languages wherewith they had been replenished.

Then those that heard him were touched with compunction, and asked the apostles, Brethren, what shall we do? Peter answered them, Repent, and be baptized, and you shall receive the Holy Ghost. Then he instructed them, baptized them, and that very day three thousand persons were added to the church (Acts iii. 1, 2, &c.). Some days after, St Peter and John, going to the temple at the hour of prayers, met at a gate of the temple a man who had been lame from his birth, so that he was carried about. This man seeing Peter and John, asked alms of them: upon which Peter said to him, Silver or gold I have not; but such as I have I give thee: In the name of Jesus of Nazareth, rise up and walk. Presently the man got up, and went into the temple along with them, lifting up his voice, and glorifying God. He held St Peter, telling the people then assembled all that had happened unto him. Then Peter, taking this occasion, told the people, that it was not by his own power that he had performed the miracle they so much wondered at, but that it was by the power of Jesus Christ that this man was healed. He then laid before them the great crime they had committed, in putting Jesus Christ to death, who was the Saviour of the world, and the Messiah; and after he had shewn them by all the prophecies that Christ was to die thus, he exhorted them to repentance, and to make a proper use of the death of Christ.

He was thus speaking to the people, when the priests and Sadducees coming upon them, laid hold on Peter and John, and put them in prison, until the day following, it being now late (Acts iv. 1, 2, &c.). But the number of those that were converted this day at the second preaching of St Peter was about five thousand. The day following, the rulers, magistrates, and chief

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chief priefts being affembled on this occafion, ordered the apoftles to be brought before them; and then afked them, by whofe authority they performed the miracle of healing the lame man? St Peter anfwered, that it was in the name of Jefus of Nazareth, whom they had crucified, and whom God raifed again from the dead. The affembly were furprifed at the boldnefs of the apoftles upon this occafion: but came to a refolution to difmifs them, charging them at the fame time to teach no more in the name of Jefus; and threatening them if they fhould perfift in difobedience to thefe orders. The two apoftles returned to their brethren, and related to them all that had paffed; which having heard, the brethren raifed their voices to heaven, begging God to give them ftrength and courage to declare his word with perfect liberty; and having finifhed their prayers, the place fhook wherein they were affembled, and they were again filled with the Holy Ghoft.

At this time many of the faithful fold their eftates, and brought the money to the apoftles (*id.* v. 1, 2, &c.). Of this number was a man called Ananias, with his wife Sapphira, who, by a private agreement between themfelves, concealed a part of the money for which they had fold their land, and brought the reft to St Peter, as if it were the whole fum. Ananias came firft; and St Peter faid to him, Ananias, how came Satan to feduce you, and to prevail with you to lie to the Holy Ghoft, by concealing part of the price of your land? It is not men that you thought to impofe on, but God. Immediately Ananias fell down dead, and they carried him out and buried him. About three hours after his wife Sapphira came in, and St Peter faid to her almoft the fame things he had before faid to her hufband, and immediately fhe fell down alfo, and gave up the ghoft. This affair infufed a great awe in the whole church, and amongft all thofe that heard of it. (See Acts v.).

The number of believers confiderably increafed every day; fo that they even brought out the fick into the ftreets, and laid them where Peter was to pafs, that at leaft his fhadow might cover fome of them, by which means they were healed of their diftempers. Then the high-prieft and his affociates, that is, the Pharifees, caufed the apoftles to be apprehended and put into prifon. But an angel brought them forth, and bid them go into the temple, and there boldly declare all the words of life which God had taught them. This they performed: upon which the princes and priefts caufed them to be brought before them; and having demanded why they had difobeyed their orders in continuing to fpeak ftill in the name of Jefus Chrift, Peter and the apoftles anfwered, that it was more neceffary to obey God than man. This anfwer provoked them very much, and they were going to condemn them to death, when Gamaliel prevailed with them to change their refolution, by reprefenting to them, that if this matter proceeded from God, it was in vain for them to oppofe it; but if otherwife, then it fhould foon vanifh of itfelf. So they difmiffed the apoftles, after giving them 39 ftripes a-piece, and charged them to fpeak no more in the name of Jefus Chrift.

After the martyrdom of St Stephen, a perfecution was carried on againft the faithful at Jerufalem, and they were obliged to take fhelter in feveral places. The apoftles alone continued at Jerufalem (Acts viii. 1, 2, 3, &c.). St Philip the deacon going to Samaria, the Samaritans received the word of the Lord, and feveral of them were baptized. Then St Peter and St John repaired thither alfo, to give them the Holy Ghoft; which St Philip, being only a deacon, had not power to do. Simon the magician was alfo baptized among others; and admiring the power that the apoftles had, of conferring the Holy Ghoft, would have bought the fame power of the apoftles, and accordingly offered money to St Peter. But Peter with indignation replied to him, Thy money and thou perifh together, who thinkeft the gifts of God can be bought with money! Thou haft no part with us, nor haft any pretenfions to this miniftry, for thy heart is not right before God. Repent therefore of this wickednefs, and pray to God if perhaps he will pardon the wicked thoughts of thy heart. After this Peter and John returned again to Jerufalem. See Acts viii.

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The fire of perfecution being now pretty well extinguifhed, St Peter departed from Jerufalem (Acts ix. 32, &c.), and vifiting the difciples from city to city, he came alfo to fee the faints that dwelt at Lydda. Here he found a man called Æneas, who had been paralytic for eight years. St Peter faid to him, Æneas, rife up; Jefus Chrift the Lord cures you. He prefently got up; and all that dwelt at Lydda that faw the miracle were converted to the Lord. There was alfo at Joppa a certain holy woman, named Tabitha, who happening to die while St Peter was at Lydda, the difciples fent to defire him to come to them. Whereupon St Peter came, and entering into the chamber where Tabitha lay dead, he caufed every body to go out, and betook himfelf to prayers. Then turning himfelf towards the corpfe, he faid, Tabitha, arife. At which inftant fhe opened her eyes, and feeing St Peter, fhe fat up. This miracle was much famed at Joppa, and was the occafion that many were converted. St Peter ftayed there a good while, taking up his lodging with one Simon a tanner.

Now there was at Cæfarea of Paleftine a centurion called Cornelius, a man that feared God (Acts x. 1, 2, 3.), and to whom it was revealed by an angel, that he fhould fend to Joppa to Peter, who fhould tell him what he had to do. Cornelius immediately fent two of his fervants; and while they were upon the road, the Lord fent a vifion to Peter, to prepare him to go to this man without any fcruple, although he was not a Jew; for as yet the door of the gofpel had not been opened to the Gentiles. St Peter, then being at the top of the houfe, fell into a trance, and faw, as it were, a great fheet of linen let down from heaven, which was full of all kinds of animals and reptiles, both clean and unclean. He had this vifion three times, and heard a voice, faying, Arife Peter, kill and eat. But Peter anfwered, Lord, I have never eaten any thing unclean. The voice replied, Call not that unclean which God has purified. After which the fheet was again taken up into heaven. At the fame time, the men came in that had been fent by Cornelius. They acquainted him with what had happened to their mafter, and defired him to go along with them to Cæfarea. The day following St Peter fet out thither, and was accompanied by fome of the brethren of Joppa. (See Acts x.).

When

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When Peter was returned to Jerusalem, the faithful of the circumcision said to him, why have you gone unto the uncircumcised, and why do you eat with them? but Peter having related to them all that passed, they were satisfied, and glorified God who had given the gift of repentance leading to life as well to the Gentiles as to the Jews. It is thought, that a little after this Peter went to Antioch, where he founded the Christian church of which he was bishop (Gal. ii. 11). It is believed that he continued here seven years, though not constantly: for during this time, he went to Jerusalem, and to the provinces of Asia Minor, to Bithynia, Cappadocia, and Pontus, as is concluded from the epistle that he afterwards addressed to the faithful of these provinces. From thence he went to Rome, in the 42d year of the Christian era; and it is thought that at his leaving Antioch he there fixed St Ignatius in his place. Eusebius thinks, that the chief occasion of his going to Rome was to oppose Simon Magus, who by his deceits had perverted a great number of persons. However, the presence of St Peter, and the true miracles that he opposed to the tricks of Simon, ruined, or much diminished, the reputation of this impostor.

St Peter, leaving Rome, came to Jerusalem at the passover, in the 44th year of the Christian era, when Herod Agrippa began to persecute the church. That prince put St James the Greater, brother of John, to the sword (Acts xii. 1, &c.); and perceiving that his death was agreeable to the Jews, he moreover caused Peter to be apprehended and put in prison, with a design of executing him publicly after the passover. But the very night that Herod thought of putting him to death, as Peter, loaded with chains, was asleep between two soldiers, the angel of the Lord awakened him, broke off his chains, opened the prison door, and brought him out the length of the street. Then the angel leaving him, he came to the house of Mary the mother of John, where many of the faithful were assembled at prayers; and having knocked at the door, a damsel named Rhoda came to open it; but when she heard Peter's voice, instead of opening the door, she ran in a transport of joy to acquaint the family that Peter was at the door. Those who heard her could not believe it, and said, it was his angel, and not himself: but continuing to knock, and being let in, he informed them of what had happened to him.

He then left Jerusalem; but we are not told what became of him till the time of the council held at Jerusalem in the year 51. It is thought that before this time he made his second journey to Rome, from whence he wrote his first epistle.

St Peter was obliged to leave Rome in the year 51 by order of the emperor Claudius, who had banished all Jews from thence, because of the tumults they continually raised there, excited by one Chrestus, as Suetonius says, meaning probably by this name Jesus Christ. The apostle then returned into Judea, where was held the council of Jerusalem; in which, after a strict examination of the matter proposed to Peter and the apostles, he spoke to them with much wisdom, saying (Acts xv. 7, 8, &c.) that God having given his Holy Ghost and the gift of faith to the Gentiles as well as to the Jews, they ought not to impose the yoke of the legal observances on the new converts, which (as he says) neither we nor our fathers have been able to bear. But we believe, that it is through the grace of Jesus Christ that both we and they shall be saved. St James the Less, bishop of Jerusalem, seconded this opinion of St Peter; and the council came to this conclusion, That no new obligation should be imposed on the Gentiles, but only that they should be required to abstain from fornication, from the use of blood, and from meats offered to idols. The resolution of this council was written to the faithful of Antioch, because it was there this question was first started.

Some time after, St Peter coming to Antioch (Gal. ii. 11. &c.), he ate and drank with the Gentiles, without regarding that distinction of meats enjoined by the law. But after that, when some of the faithful of Jerusalem came to Antioch, being converted Jews, St Peter, out of fear to offend them, separated himself from the converted Gentiles, and would no longer eat with them as before. St Paul, fearing that what St Peter did might be interpreted, as if he had a desire to oblige the Gentiles to judaize, and to submit themselves to the yoke of the law, and so to revoke and annul what he himself had determined in the council of Jerusalem, he withstood Peter to his face, and openly expostulated with him, telling him, he was much in the wrong to endeavour to oblige the Gentiles, at least tacitly by his own manner of acting, to live as the Jews do; and St Peter received this reprehension with silence and humility.

The particulars of St Peter's life are little known from the 51st year of the vulgar era, in which the council of Jerusalem was held, till his last journey to Rome, which was some time before his death. Then being acquainted by revelation that the time of his death was not far off (2 Pet. i. 14.), he had a mind to write to the faithful that had been converted by him, to put them in mind of the truths he had before taught them. He sent them therefore his second epistle.

St Peter and St Paul came to Rome about the same time, in the year of Christ 65, where they performed many miracles, and made many converts. Simon Magus by his tricks continued here to deceive the people, pretending himself to be the Messiah, and even attempting to ascend into heaven; for having caused himself to be carried up into the air by his dæmons, in a fiery chariot, St Peter and St Paul betook themselves to their prayers; and then the impostor, being forsaken by his dæmons, fell down upon the ground, which fall some time afterwards occasioned his death. See Simon Magus.

Soon after this, St Peter was taken up and thrown into prison, where it is said he continued for nine months; at last he was crucified at Rome in the Via Ostia; with his head downwards, as he himself had desired of his executioners. This he did out of a sense of humility, for fear it should be thought, as St Ambrose says, that he affected the glory of Jesus Christ, and the more to augment the pain of his execution.

It is said, that the body of St Peter was at first buried in the catacombs, two miles from Rome, from whence it was afterwards transported to the Vatican, where it has lain ever since. His festival is celebrated with that of St Paul on the 29th of June. St Peter died in the 66th year of the vulgar era, after having been bishop of Rome for about 24 or 25 years. His age might be about 74 or 75 years. It is generally agreed,

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agreed, that St Linus was his succeſſor. The following is the portraiture that Nicephorus gives us of St Peter, which he has probably taken from the ancient pictures that were preſerved of this apoſtle. He was not fat, but pretty tall and upright, having a fair and paliſh countenance. The hair of his head and beard was thick, frizzled, and not long. His eyes were black, and blood-ſhot; his eyebrows protuberant and lofty; his noſe ſomething long, and rather flat than ſharp.

The two epiſtles of St Peter are addreſſed to thoſe Jewiſh converts who were ſcattered throughout Pontus, Galatia, &c. not only upon the perſecution raiſed at Jeruſalem, but upon former diſperſions of the Jews into thoſe places on ſeveral other occaſions. The firſt epiſtle is principally deſigned to comfort and confirm them under thoſe fiery trials and manifold temptations they were then ſubject to, and to direct and inſtruct them how to behave in the ſeveral ſtates and relations both of the civil and the Chriſtian life, that they might not be engaged in thoſe rebellions againſt Cæſar and his officers, then fomented among the Jews; and that they might ſtop the mouths of thoſe who ſpoke againſt them as evil doers. In the ſecond epiſtle, he proſecutes the ſame ſubject, to prevent their apoſtaſy from the faith, on account of any perſecutions they were liable to. He likewiſe guards them againſt the corrupt principles of the Gnoſtics, and thoſe who ſcoffed at the promiſe of Chriſt's coming, as if it would never be verified.

Blackwell's Sacred Claſſics defended.

St Peter's ſtyle, ſays a modern author, expreſſes the noble vehemence and fervour of his ſpirit, the full knowledge he had of Chriſtianity, and the ſtrong aſſurance he had of the truth and certainty of his doctrine; and he writes with the authority of the firſt man in the college of the apoſtles. He writes with that quickneſs and rapidity of ſtyle, with that noble neglect of ſome of the formal conſequences and niceties of grammar, ſtill preſerving its true reaſon and natural analogy (which are always marks of a ſublime genius), that you can ſcarce perceive the pauſes of his diſcourſe and diſtinction of his periods. The great Joſeph Scaliger calls St Peter's firſt epiſtle majeſtic; and we hope he was more judicious than to exclude the ſecond, though he did not name it.

A noble majeſty, and becoming freedom, is what diſtinguiſhes St Peter; a devout and judicious perſon cannot read him without ſolemn attention and awful concern. The conflagration of this lower world, and future judgment of angels and men, in the third chapter of the ſecond, is deſcribed in ſuch ſtrong and terrible terms, ſuch awful circumſtances, that in the deſcription we ſee the planetary heavens and this our earth wrapped up with devouring flames, hear the groans of an expiring world, and the craſhes of nature tumbling into univerſal ruin.

The authority of the ſecond epiſtle of St Peter was for ſome time doubted of, as Origen, Euſebius, St Jerome and others have obſerved. What made the ancients call it in queſtion, is the difference of its ſtyle from the firſt. The third chapter, which deſcribes the cataſtrophe of the viſible world, made Grotius think this epiſtle was wrote after the taking of Jeruſalem; becauſe that was not to happen till after the deſtruction of that city; upon which he conjectures, that Simeon biſhop of Jeruſalem is the author of this epiſtle, and that the inſcription which carries St Peter's name is corrupted. But the beſt critics admit this epiſtle to be the genuine work of St Peter, who diſcovers himſelf, where he ſays, that he was preſent at our Lord's transfiguration; and where he tells the Jews, this was the ſecond letter he had written to them. The reader may ſee this queſtion fully diſcuſſed, and the authority of this epiſtle eſtabliſhed beyond all doubt, by the learned Dr Sherlock, in his *Diſſertation* on the authority of the Second Epiſtle of St Peter.

St Peter has been made the author of ſeveral books; ſuch were, his Acts, his Goſpel, his Revelation, his work about preaching, and another about judgment. There is extant a large hiſtory of St Peter, called the *Recognitions*, aſcribed to St Clement.

PETER of Blois, a learned man of the 12th century, was born about the year 1120, at the city of Blois in France, from whence he derived his name. His parents, being opulent, gave him a learned education. In his youth, when he ſtudied in the univerſity of Paris, he was exceſſively fond of poetry; and when he was a little further advanced in life, he became no leſs fond of rhetoric, to the ſtudy of which he applied with the greateſt ardour. From Paris he removed to Bononia in Italy, to acquire the civil and canon law; in the knowledge of both which he very much excelled. He appears from his writings to have cultivated medicine, and ſeveral branches of the mathematics, with no little care and ſucceſs. The ſtudy of theology was the chief delight and buſineſs of his life, in which he ſpent the greateſt part of his time, and made the greateſt progreſs. But unfortunately it was that ſcholaſtic theology, which conſiſted in vain attempts to prove and explain the many abſurd opinions which then prevailed in the church, by the ſubtleties of Ariſtotelian logic. In attempting to explain in this manner the moſt abſurd of all opinions that ever exiſted amongſt mankind, he was the very firſt perſon who employed the famous word *tranſubſtantiation*, which was ſoon after adopted by the church of Rome, and hath ever ſince made ſo great a noiſe. Being appointed preceptor to William II. king of Sicily in 1167, he obtained the cuſtody of the privy ſeal; and, next to the archbiſhop of Palermo, the prime miniſter, had the greateſt influence in all affairs. But his power was not of long duration; for the archbiſhop being baniſhed in 1168, our author ſoon after left the court of Sicily, and returned into France. He was not long, however, without a royal patron, being invited into England by Henry II. who employed him as his private ſecretary, made him archdeacon of Bath, and gave him ſome other benefices. When he had ſpent a few years at court, he conceived a diſguſt at that way of life (of which he hath drawn a very unpleaſing picture in one of his letters), and retired into the family of Richard archbiſhop of Canterbury, who had made him his chancellor about the year 1176. In this ſtation he continued to the death of the archbiſhop in 1183, enjoying the higheſt degree of favour with that prelate, though he uſed much freedom in reproving him for his remiſſneſs in the government of the church. Our author remained in the ſame ſtation in the family of Archbiſhop Baldwin, who ſucceeded Richard, acting both as his ſecretary and chancellor. He was alſo ſent by that prelate on an embaſſy to Rome in 1187, to plead his cauſe before

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fore Pope Urban III. in the famous controverfy between him and the monks of Canterbury about the church of Hackington. After the departure of his friend and patron Baldwin for the Holy Land in 1190, our author was involved in various troubles in his old age, the caufes of which are not diftinctly known; and died about the end of the 12th century. He appears from his works, which may be juftly reckoned among the moft valuable monuments of the age in which he flourifhed, to have been a man of great integrity and fincere piety, as well as of a lively inventive genius and uncommon erudition. His printed works confift of 134 letters, which he collected together at the defire of Henry II.; of 65 fermons, delivered on various occafions; and of 17 tracts on different fubjects.

PETER the Hermit. See CROISADE and HERMIT.

PETER I. juftly ftyled *Peter the Great*, czar, and afterwards emperor, of Ruffia, founder of the Ruffian empire; for though the country was well known, and of great antiquity, yet it had no extent of power, of political influence, or of general commerce, in Europe, till his time. He was born in 1672; and was proclaimed czar when but ten years of age, in exclufion of John his elder brother, who, being of a fickly conftitution, was at the fame time very weak in his underftanding. The princefs Sophia, his half-fifter, made an infurrection in favour of John; and to put an end to the civil war, it was at laft agreed that the two brothers fhould jointly fhare the imperial dignity. Peter had been very ill brought up, not only through the general defects of the Ruffian education, but likewife through the arts of the princefs Sophia, who furrounded him with every thing that might ftifle his natural defire of knowledge, deprave his mind, and enervate it with pleafures. Notwithftanding this, his inclination for military exercifes difcovered itfelf in his tendereft years. He formed a company of 50 men, commanded by foreign officers, clothed and exercifed after the German manner. He entered himfelf into the loweft poft, that of a drummer; and never rofe otherwife than as a foldier of fortune. Herein his defign was to teach his nobility, that merit, not birth, was the only title to military employments. He reinforced his company with feveral others, till at laft he had got together a confiderable body of foldiers. As he then had no war on his hands, he exercifed them in all forts of mock engagements, and by this means fecured to himfelf a body of well-difciplined troops. The fight of a Dutch veffel, which he had met with on a lake belonging to one of his pleafure-houfes, made fuch an impreffion on his mind, that he conceived the almoft impracticable defign of forming a navy. His firft care was to get fome Hollanders to build fome fmall veffels at Mofcow; and he paffed two fucceffive fummers on board Englifh or Dutch fhips, which fet out from Archangel, that he might inftruct himfelf in every branch of naval affairs (A). In 1696 czar John died, and Peter was now fole mafter of the empire. In 1698 he fent an embaffy to Holland; and went *incognito* in the retinue, and vifited England, as well as Holland, in order to inform himfelf fully in the art of fhip-building. At Amfterdam he worked in the yard as a private fhip-carpenter, under the name of *Peter Michaeloff*; but he has been often heard to fay, that if he had never gone to England, he had ftill remained ignorant of that art. In 1700 he had got together a body of ftanding forces, confifting of 30,000 foot; and now the vaft project he had formed difplayed itfelf in all its parts. He opened his dominions, which till then had been fhut up, having firft fent the chief nobility of his empire into foreign countries to improve themfelves in knowledge and learning. He invited into Ruffia all the foreigners he could meet with, who were capable of inftructing his fubjects in any manner, and offered them great encouragement to fettle in his dominions. This raifed many difcontents; and the defpotic authority he exerted on that occafion was fcarcely powerful enough to fupprefs them. In 1700, being ftrengthened by the alliance of Auguftus king of Poland, he made war on Charles XII. king of Sweden. His firft ill fuccefs did not deter him; for he ufed to fay, I know that my armies muft be overcome for a great while; but even this will at laft teach them to conquer. He afterwards gained confiderable advantages; and founded Peterfburg in 1703. In 1709 he gained a complete victory over the Swedes at Pultowa. In 1712 he was inclofed by the Turks on the banks of the Pruth; and feemed inevitably loft, had not the czarina Catherine bribed the grand vifir, and the czar's prudence completed his deliverance. In 1716 he made a tour through Germany and Holland, and vifited the royal academy of fciences at Paris. It would be endlefs to enumerate all the various eftablifhments for which the Ruffians are obliged to him. He formed an army according to the manner of the politeft and moft experienced nations: he fitted out fleets in all the four feas which border upon Ruffia: he caufed many ftrong fortreffes to be raifed after the beft plans; and made convenient harbours: he introduced arts

(A) The following circumftance, it is faid, in fome meafure determined Peter to attempt thofe reformations which he afterwards accomplifhed. Great events have been fometimes the effect of little caufes; and it is at leaft poffible, that without the occurrence we are going to relate, Ruffia might ftill have been in a ftate of barbarifm. A young Genevefe, called *Le Fort*, about 1695, went to Mofcow with the Danifh ambaffador. The czar Peter, who was then 19 years old, met with this Genevefe, who had foon learnt the Ruffian tongue, and fpoke almoft all the languages of Europe. Le Fort ingratiated himfelf with the prince, entered into his fervice, and foon afterwards into his familiarity. He made him comprehend that there was a different manner of living and reigning from what had unhappily obtained throughout his vaft and miferable empire. A prince muft be born with an uncommon greatnefs of foul to liften readily to a ftranger, and to be able to diveft himfelf of the prejudices of a throne and of his country. The czar was fenfible that neither himfelf nor his people were yet to be reckoned among men; and that he had an empire to form, but could have no affiftance at home. From that time he took a refolution to leave his dominions; and fet out, like another Prometheus, to borrow celeftial fire for animating his countrymen.

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arts and ſciences into his dominions, and freed religion from many ſuperſtitious abuſes: he made laws, built cities, cut canals, &c.; was generous in rewarding, impartial in puniſhing; faithful, laborious, and humble; yet was not free from a certain roughneſs of temper natural to his nation. He had indeed cured himſelf of exceſs in drinking; but he has been branded with ſeveral other vices, particularly cruelty. He publiſhed the unfortunate hiſtory of his ſon Prince Alexis (B); towards whom ſome blame his ſeverity, while others think it no more than was neceſſary. He perfectly knew the honour due to perſons of merit; and not only heaped honours upon them during their life, but gave them marks of eſteem even after their death. He died of the ſtrangury in 1725, and left the world with the magnanimity of a hero and the piety of a Chriſtian.

Peter was tall of ſtature, and of a bold and majeſtic aſpect, though ſometimes diſfigured by convulſions, which altered his features. This deformity was aſcribed to poiſon, given him, as it is ſaid, by his ſiſter Sophia; but it was indeed no other than wine and brandy, which he often drank to exceſs, relying too much on the ſtrength of his conſtitution. He converſed with perſons in all ſtations, from the mechanic to the general of an army; and his converſation was neither like that of a barbarian who makes no diſtinction between men, nor of a popular prince who ſeeks to pleaſe all the world, but that of a perſon who aims at inſtruction. He loved women as much as the king of Sweden, his rival, dreaded them, and all were equally agreeable to him; he valued himſelf on drinking large draughts, rather than ſipping delicious wine. We are told that kings and legiſlators ſhould never ſuffer themſelves

(B) Alexis, like his father, is ſaid to have married a ſlave, and, like him, quitted Muſcovy ſecretly, but had not the ſame ſucceſs in his undertakings; and the being but a bad imitator of his father, coſt him his life. He became an example of the moſt terrible ſeverity that ever was given from the tribunal of the throne: but, what is much to the honour of the empreſs Catherine, ſhe had no hand in the misfortunes of that prince, who was born of another woman, and loved nothing that his father loved. Catherine was not in the leaſt ſuſpected of acting the cruel ſtepmother. The great crime of the unfortunate Alexis was his being too much a Ruſſian, and his diſapproving every thing that was grand and immortal, and projected by his father for the glory of the nation. One day, hearing ſome Muſcovites lamenting the inſupportable fatigues they were to undergo in the building of Peterſburg, he ſaid, "Take courage, this city will not ſtand long." When he was called to attend his father in a journey of 600 or 700 leagues, which the czar often made, he feigned ſickneſs. He took violent purges for a diſtemper which he had not; and ſuch quantities of medicines, with exceſſive drinking of brandy, impaired his health and his wits. At firſt he had an inclination to learning, was acquainted with geometry and hiſtory, and had learnt the German tongue: but he hated war, and would never learn it; for which he was moſt reproached by his father. They had married him in 1711 to the princeſs of Wolfenbuttle, ſiſter of the empreſs conſort to Charles VI. This marriage was unfortunate; the princeſs was often abandoned for a debauch in brandy, and for Afroſina, a Finland wench, of a large ſtature, well made, and very agreeable. It is reported that the princeſs died of chagrin, if it be poſſible for chagrin to prove mortal; and that afterwards the czarowitz ſecretly eſpouſed Afroſina in 1713, when the empreſs Catherine had juſt brought him a brother, at which he had no reaſon to be uneaſy.

The miſunderſtandings between the father and the ſon became every day more ſerious; till at length the father, about the year 1716, threatened the prince to diſinherit him; and the prince told him that he intended to go into a monaſtery.

The czar, in 1717, renewed his journeys, as well with a view to politics as curioſity. He came at laſt into France. If the ſon had entertained an inclination to revolt, if he had actually had a party formed in his favour, now was the time to declare himſelf; but inſtead of remaining in Ruſſia, making himſelf popular, and creating dependents, he took a journey in his turn, having with much difficulty ſcraped together ſome thouſands of ducats which he had ſecretly borrowed. He threw himſelf under the protection of the emperor Charles VI. brother of his deceaſed wife. They kept him for ſome time *incognito* at Venice, from whence he paſſed to Naples, where he reſided almoſt a year, while neither his father nor any perſon in Ruſſia knew the place of his retreat.

While the ſon kept himſelf thus concealed, the father was at Paris, where he was received with all the reſpect paid him in other places, but with a gallantry nowhere to be found but in France. If he went to viſit a manufactory, and one piece of work attracted his ſight more than another, he was preſented with it the next day. He went to dine at the duke d'Antin's at Petitbourg, where the firſt thing he ſaw was his own picture at full length, in the ſame habit that he wore. When he was at the royal mint of medals, they ſtruck all kinds before him, and preſented him with them; at laſt they ſtruck one which they let drop on purpoſe at his feet, and left him to take it up. He there ſaw himſelf perfectly engraven with theſe words, *Peter the Great.* The reverſe was a Fame, and round her in letters *Vires acquirit eundo;* an alluſion no leſs juſt than flattering to a prince who really acquired new merit by travelling.

After he had ſeen this country, where every thing diſpoſes men to gentleneſs and indulgence, he returned to his own, and reſumed his ſeverity. He had engaged his ſon to return from Naples to Peterſburg, from whence that young prince was conducted to Moſcow before the czar his father; who began with depriving him of his ſucceſſion to the throne, by making him ſign a ſolemn act of renunciation at the end of January 1718, in conſideration of which act the father promiſed the ſon to ſpare his life.

It was not altogether improbable that ſuch an act would have been ſome time or other annulled. The czar, therefore,

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themſelves to be tranſported by paſſion; but never was any man more paſſionate than Peter the Great, or more mercileſs. In a king this is more than an infirmity for which we make amends by confeſſing it; but it was generally remarked of Peter, and he himſelf ſaid to a magiſtrate of Holland, at his ſecond voyage, "I have reformed my nation, and have not been able to reform myſelf." It is true, the cruelties with which he is reproached were not novelties at the court of Moſcow, any more than at that of Morocco: it was not uncommon to ſee a czar, with his own royal hand, inflict 100 laſhes on the naked ſhoulders of a prime officer of the crown, or of a lady of the palace, for failing in their duty, by getting drunk; or to try the goodneſs of his ſabre, by ſtriking off the head of a criminal. Peter had himſelf performed ſome of thoſe ceremonies of his country; Le Fort, however (ſee note A), had authority enough over him at times to ſtay his hand even when lifted up to ſtrike, but he had not Le Fort always near him.

The czar's firſt marriage is thus related in the memoirs of Peter Henry Bruce, Eſq. "It took place in 1690, when he was only 18. He was married to Ottokeſſa Lapuchin, a boyar's daughter, by whom he had Prince Alexis; ſome time after he turned her away and ſhut her up in a monaſtery, on ſuſpicion of infidelity. It was ſaid, that in one of her jealous fits ſhe charged Prince Menzikoff with carrying the czar to drabs of his former acquaintance, who had been his cuſtomers for cakes; upbraiding him with his firſt occupation: and that Menzikoff ever after bore an irreconcileable enmity to both her and her ſon. After the divorce, one Miſs Mons, a very beautiful young lady, born at Moſcow, of foreign parents, was much in favour with the czar; but when he was abroad, Mr Keyſerling, then reſiding at Moſcow as envoy from the king of Pruſſia, paid his addreſſes to, and married her. When the czar returned, he was ſo much offended at Keyſerling, that he ordered him to leave Moſcow, which occaſioned his immediate recal by the king his maſter, who ſent another in his room. It was believed, if his public character had not protected him, he would have ſeverely felt his majeſty's diſpleaſure.

"The czar was ſome time after ſmitten with the charms of another beautiful young lady, the daughter of a foreign merchant in this city: he firſt ſaw her in her father's houſe, where he dined one day. He was ſo much taken with her appearance, that he offered her any terms ſhe pleaſed, if ſhe would live with him; which this virtuous young woman modeſtly refuſed: but dreading the effects of his authority, ſhe put on a reſolution, and left Moſcow in the night, without communicating her deſign even to her parents. Having provided a little money for her ſupport, ſhe travelled on foot ſeveral miles into the country, till ſhe arrived at a ſmall village where her nurſe lived with her huſband and their daughter, the young lady's foſter-ſiſter, to whom ſhe diſcovered her intention of concealing herſelf in the wood near that village: and to prevent any diſcovery, ſhe ſet out the ſame night, accompanied by the huſband and daughter. The huſband being a timber-man by trade, and well acquainted with the wood, conducted her to a little dry ſpot in the middle of a moraſs, and there he built a hut for her habitation.

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therefore, in order to give it more force, forgetting that he was a father, and only remembering that he was the founder of an empire, which his ſon might overturn, and involve in its ancient barbarity, ordered a public proceſs to be drawn up againſt that unfortunate prince, for ſome concealment, with which he was charged, in the confeſſion that they had exacted of him.

An aſſembly was held of the biſhops, inferior eccleſiaſtics, and profeſſors; who found in the Old Teſtament, that thoſe who curſed their father or their mother ſhould be put to death; that David indeed had pardoned Abſalom, who had rebelled againſt him, but that Abſalom was never pardoned by God. Such was their opinion, without drawing any concluſion; but it was in effect ſigning a warrant for his death. Alexis had not in fact curſed his father, neither had he ever revolted like Abſalom; he had never lain publicly with the king's concubines; but he had left the kingdom without his father's permiſſion, and had written letters to his friends in which he only ſignified that he hoped they would one day be mindful of him in Ruſſia. But whatever might be his caſe, of 124 lay judges, who were appointed to ſit on him, there was not one that judged his offences leſs than capital; and thoſe who could not write, made others ſign for them. It is reported in Europe, that the czar had got tranſlated from Spaniſh into Ruſſian the criminal proceſs againſt Don Carlos, that unfortunate prince whom his father Philip I. had confined in a priſon, where the heir of that great monarchy ended his days. But there was nothing like a proceſs carried on againſt Don Carlos, nor was it ever known whether that prince died a natural or a violent death. Peter, the moſt deſpotic of princes, wanted not an example. Certain it is that the prince died the day after the ſentence, and that the czar had at Moſcow one of the beſt apothecary's ſhops in Europe. It is probable, however, that the prince Alexis, the heir of the moſt extenſive empire in the world, being condemned unanimouſly by his father's ſubjects, which were one day to be his own, might die of the ſudden ſhock and change given to the body at the apprehenſion of ſo ſtrange and diſmal a ſentence. The father went to ſee his ſon in his laſt agonies; and it is ſaid he ſhed tears. *Infelix utcunque ferent ea fata nepotes.* Theſe tears, however, did not prevent the wheels from being covered with the broken limbs of his ſon's friends. He beheaded his own brother-in-law Count Lapuchin, brother to his wife Ottokeſſa Lapuchin whom he had divorced, and uncle to Prince Alexis. The prince's confeſſor had alſo his head cut off. If Muſcovy has been civilized, ſhe has, it muſt be confeſſed, paid dear for her improvement.

The remainder of the czar's life was nothing but a ſeries of grand projects, labours, and exploits, that ſeemed to efface the memory of his exceſſive ſeverities, which were perhaps neceſſary. He made frequent ſpeeches to his court and to his council. In one he told them that he had ſacrificed his ſon to the welfare of his dominions.

tation. She had depofited her money with her nurfe to procure little neceffaries for her fupport, which were faithfully conveyed to her at night by the nurfe or her daughter, by one of whom fhe was conftantly attended in the night time.

"The next day after her flight, the czar called at her father's to fee her, and finding the parents in anxious concern for their daughter, and himfelf difappointed, fancied it a plan of their own concerting. He became angry, and began to threaten them with the effects of his difpleafure if fhe was not produced: nothing was left to the parents but the moft folemn proteftations, with tears of real forrow running down their cheeks, to convince him of their innocence, and ignorance of what was become of her; affuring him of their fears that fome fatal difafter muft have befallen her, as nothing belonging to her was amiffing, except what fhe had on at the time. The czar, fatisfied of their fincerity, ordered great fearch to be made for her, with the offer of a confiderable reward to the perfon who fhould difcover what was become of her, but to no purpofe: the parents and relations, apprehending fhe was no more, went into mourning for her.

"Above a year after this fhe was difcovered by an accident. A colonel who had come from the army to fee his friends, going to hunt in that wood, and following his game through the morafs, he came to the hut, and looking into it faw a pretty young woman in a mean drefs. After inquiring of her who fhe was, and how fhe came to live in fo folitary a place, he found out at laft that fhe was the lady whofe difappearance had made fo great a noife; in the utmoft confufion, and with the moft fervent intreaties, fhe prayed him on her knees that he would not betray her; to which he replied, that he thought her danger was now paft, as the czar was then otherwife engaged, and that fhe might with fafety difcover herfelf, at leaft to her parents, with whom he would confult how matters fhould be managed. The lady agreed to this propofal; and he fet out immediately, and overjoyed her parents with the happy difcovery; the iffue of their deliberation was to confult Madame Catherine (as fhe was then called) in what manner the affair fhould be opened to the czar. The colonel went alfo upon this bufinefs, and was advifed by Madame to come next morning and fhe would introduce him to his majefty, when he might make the difcovery and claim the promifed reward. He went according to appointment; and being introduced, told the accident by which he had difcovered the lady, and reprefented the miferable fituation in which he found her, and what fhe muft have fuffered by being fo long fhut up in fuch a difmal place, from the delicacy of her fex. The czar fhowed a great deal of concern that he fhould have been the caufe of all her fufferings, declaring that he would endeavour to make her amends. Here Madame Catherine fuggefted, that fhe thought the beft amends his majefty could make, was to give her a handfome fortune and the colonel for a hufband, who had the beft right, having caught her in purfuit of his game. The czar, agreeing perfectly with Madame Catherine's fentiments, ordered one of his favourites to go with the colonel, and bring the young lady home; where fhe arrived to the inexpreffible joy of her family and relations, who had all been in mourning for her. The marriage was under the direction and at the expence of the czar, who himfelf gave the bride to the bridegroom; faying, that he prefented him with one of the moft virtuous of women; and accompanied his declaration with very valuable prefents, befides fettling on her and her heirs three thoufand rubles a-year. This lady lived highly efteemed by the czar, and every one who knew her. Befides the concurring reports of other people, I had the ftory from her own mouth."

On the whole, that Peter I. was a great man, few will deny who know what real greatnefs is. A minute account of the life of this diftinguifhed emperor would make a large volume; we have been able to give but the mere outlines of it: the anecdotes, however, at the end, fhow in fome degree the nature of the man; at all events they fhow one important truth, that it is a more difficult thing to reform one's felf than to reform a kingdom; to conquer one's paffions, than to conquer the world. The Ruffians, however, if there be any good in civilization, owe to him every thing: and they feem to be fenfible of it; for a very pompous oration was delivered to his memory by Michael Lomonoffoff, before the Academy of Sciences at St Peterfburg, on the 26th of April 1755. For a minuter account of his improvements, &c. fee RUSSIA, PETERSBURG, and CATHERINE I.

PETER the Wild Boy. This extraordinary creature occafioned great fpeculation among the learned; but we do not know that any fatisfactory caufes have been affigned for the ftriking difference between him and other human beings.

The following account of him is extracted from the parifh-regifter of North-church, in the county of Hertford. "Peter, commonly known by the name of *Peter the Wild Boy*, lies buried in this churchyard, oppofite to the porch. In the year 1725 he was found in the woods near Hamelen, a fortified town in the electorate of Hanover, when his majefty George I. with his attendants, was hunting in the foreft of Hertfwold. He was fuppofed to be then about 12 years of age, and had fubfifted in thofe woods upon the bark of trees, leaves, berries, &c. for fome confiderable length of time. How long he had continued in that wild ftate is altogether uncertain; but that he had formerly been under the care of fome perfon, was evident from the remains of a fhirt collar about his neck at the time when he was found. As Hamelen was a town where criminals were confined to work upon the fortifications, it was then conjectured at Hanover that Peter might be the iffue of one of thofe criminals, who had either wandered into the woods and could not find his way back again, or being difcovered to be an idiot was inhumanly turned out by his parents, and left to perifh or fhift for himfelf. In the following year, 1726, he was brought over to England, by the order of Queen Caroline then princefs of Wales, and put under the care of Dr Arbuthnot with proper mafters to attend him. But notwithftanding there appeared to be no natural defect in his organs of fpeech, after all the pains that had been taken with him he could never be brought diftinctly to articulate a fingle fyllable, and proved totally incapable of receiving any inftruction. He was afterwards intrufted to the care of Mrs Titchbourn, one of the queen's bedchamber women, with a handfome penfion annexed to the charge. Mrs Titchbourn ufually fpending a few weeks every fummer at the houfe of Mr James Fenn, a yeoman farmer at Axter's

End

Peter.

End in this parish, Peter was left to the care of the said Mr Fenn, who was allowed 35l. a-year for his support and maintenance. After the death of James Fenn he was transferred to the care of his brother Thomas Fenn, at another farm-house in this parish called Broadway, where he lived with the several successive tenants of that farm, and with the same provision allowed by government to the time of his death, Feb. 22. 1785, when he was supposed to be about 72 years of age.

"Peter was well made, and of the middle size. His countenance had not the appearance of an idiot, nor was there any thing particular in his form, except that two of the fingers of his left hand were united by a web up to the middle joint. He had a natural ear for music, and was so delighted with it, that if he heard any musical instrument played upon, he would immediately dance and caper about till he was almost quite exhausted with fatigue; and though he could never be taught the distinct utterance of any word, yet he could easily learn to hum a tune. All those idle tales which have been published to the world about his climbing up trees like a squirrel, running upon all fours like a wild beast, &c. are entirely without foundation; for he was so exceedingly timid and gentle in his nature, that he would suffer himself to be governed by a child. There have been also many false stories propagated of his incontinence; but from the minutest inquiries among those who constantly lived with him, it does not appear that he ever discovered any natural passion for women, though he was subject to the other passions of human nature, such as anger, joy, &c. Upon the approach of bad weather he always appeared sullen and uneasy. At particular seasons of the year he showed a strange fondness for stealing away into the woods, where he would feed eagerly upon leaves, beech-mast, acorns, and the green bark of trees, which proves evidently that he had subsisted in that manner for a considerable length of time before he was first taken. His keeper therefore at such seasons generally kept a strict eye over him, and sometimes even confined him, because if he ever rambled to any distance from his home he could not find his way back again: and once in particular, having gone beyond his knowledge, he wandered as far as Norfolk, where he was taken up, and being carried before a magistrate, was committed to the house of correction in Norwich, and punished as a sturdy and obstinate vagrant, who would not (for indeed he could not) give any account of himself: but Mr Fenn having advertised him in the public papers, he was released from his confinement, and brought back to his usual place of abode.

"Notwithstanding the extraordinary and savage state in which Peter was first found greatly excited the attention and curiosity of the public; yet, after all that has been said of him, he was certainly nothing more than a common idiot without the appearance of one. But as men of some eminence in the literary world have in their works published strange opinions and ill-founded conjectures about him, which may seem to stamp a credit upon what they have advanced; that posterity may not through their authority be hereafter misled upon the subject, this short and true account of Peter is recorded in the parish-register by one who constantly resided above 30 years in his neighbourhood, and had daily opportunities of seeing and observing him."

Perhaps our readers will not be displeased if we present them with Lord Monboddo's account of this extraordinary creature (A). "It was in the beginning of June 1782 (says his lordship) that I saw him in a farm-house called Broadway, within about a mile of Berkhamstead, kept there upon a pension which the king pays. He is but low of stature, not exceeding five feet three inches; and although he must now be about 70 years of age, has a fresh healthy look. He wears his beard; his face is not at all ugly or disagreeable; and he has a look that may be called sensible and sagacious for a savage. About 20 years ago he was in use to elope, and to be missing for several days; and once, I was told, he wandered as far as Norfolk; but of late he has been quite tame, and either keeps in the house or saunters about the farm. He has been the 13 last years where he lives at present; and before that he was 12 years with another farmer, whom I saw and conversed with. This farmer told me, that he had been put to school somewhere in Hertfordshire, but had only learned to articulate his own name Peter, and the name of King George, both which I heard him pronounce very distinctly. But the woman of the house where he now is (for the man happened not to be at home) told me, that he understood every thing that was said to him concerning the common affairs of life; and I saw that he readily understood several things that she said to him while I was present. Among other things she desired him to sing Nancy Dawson; which he did, and another tune which she named. He never was mischievous, but had always that gentleness of nature which I hold to be characteristical of our nature, at least till we became carnivorous, and hunters or warriors. He feeds at present as the farmer and his wife do; but, as I was told by an old woman (one Mrs Collop, living at a village in the neighbourhood called Hempstead, who remembered to have seen him when he first came to Hertfordshire, which she computed to be 55 years before the time I saw her), he then fed very much upon leaves, and particularly upon the leaves of cabbage, which he ate raw. He was then, as she thought, about 15 years of age, walked upright, but could climb trees like a squirrel. At present he not only eats flesh, but has also got the taste of beer, and even of spirits, of which he inclines to drink more than he can get. And the old farmer above mentioned, with whom he lived twelve years before he came to this last farmer, told me, that he had acquired that taste before he came to him, which is about 25 years ago. He has also become very fond of fire, but has not yet acquired a liking for money; for though he takes it, he does not keep it, but gives it to his landlord or landlady, which I suppose is a lesson that they have taught him. He retains so much

(A) This eccentric writer, in support of his hypothesis, that man in a state of nature is a mere animal, without clothes, houses, the use of fire, or even speech, adduces the oran-outang, or man in the woods, and this Peter the wild man and others, as examples. He denies the want of the organs of speech as an objection, and insists they only want the artificial use of them.

much of his natural inſtinct, that he has a fore-feeling of bad weather, growling and howling, and ſhowing great diſorder, before it comes.

"Theſe are the particulars concerning him which I obſerved myſelf, or could learn by information from the neighbourhood." From all theſe facts put together his lordſhip makes the following obſervations:

"1ſt, Whatever doubts there may be concerning the humanity of the oran-outang, it was never made a queſtion but that Peter was a man.

"2dly, That he was, as the Dean [Swift] ſays, of a father and mother like one of us. This, as I have ſaid, was the caſe of two ſavages found in the Diſmal ſwamp in Virginia, of the one found in the iſland of Diego Garcia, and of him that was diſcovered by M. le Roy in the Pyrenees, and in general of all the ſavages that have been found in Europe within theſe laſt 300 years; for I do not believe, that for theſe 2000 years paſt there has been a race of ſuch ſavages in Europe.

"3dly, I think there can be no reaſon to doubt of what was written from Hanover, and publiſhed in the newſpapers, that he was found going upon all fours, as well as other ſolitary ſavages that have been found in Europe. It is true that others have been found erect; which was the caſe of the two found in the Diſmal ſwamp of Virginia, likewiſe of the man of the Pyrenees, and of him in the iſland of Diego Garcia; but theſe I ſuppoſe were not expoſed till they had learned to walk upright; whereas Peter appears to have been abandoned by his parents before he had learned that leſſon, but walked as we know children do at firſt.

"4thly, I think it is evident that he is not an idiot, not only from his appearance, as I have deſcribed it, and from his actions, but from all the accounts that we have of him, both thoſe printed and thoſe atteſted by perſons yet living; for as to the printed accounts, there is not the leaſt information of that kind in any of them, except in one, viz. Wye's letter, N° 8. wherein is ſaid, that ſome imputed his not learning to ſpeak to want of underſtanding; which I ſhould think ſhowed rather want of underſtanding in thoſe who thought ſo, when it is conſidered that at this time he had not been a year out of the woods, and I ſuppoſe but a month or two under the care of Dr Arbuthnot, who had taken the charge of his education. The Dean indeed tells us, that he ſuſpected he was a pretender, and no genuine wild man, but not a word of his being an idiot. And as to the perſons living, not one with whom I have converſed appeared to have the leaſt ſuſpicion of that kind; though it is natural that men who were not philoſophers, and knew nothing of the progreſs of man from the mere animal to the intellectual creature, nor of the improvement of our underſtanding by ſocial intercourſe and the arts of life, but believed that man when he came to a certain age has from nature all the faculties which we ſee him exert, and particularly the faculty of ſpeech, ſhould think him an idiot, and wanting even the capacity of acquiring underſtanding. I knew an officer of dragoons, a man of very good ſenſe, who was quartered where Peter then lived for ſome months, and ſaw him almoſt every day, and who aſſured me that he was not an idiot, but ſhowed common underſtanding, which was all that could be expected from one no better educated than he.

"Laſtly, thoſe who have conſidered what I have ſaid (B) of the difficulty of articulation, will not be ſurpriſed that a man who had lived a ſavage for the firſt 14 or 15 years of his life, ſhould have made ſo little progreſs in that art. I cannot, however, have the leaſt doubt, that if he had been under the care of Mr Braidwood of Edinburgh, he would have learned to ſpeak, though with much more difficulty than a man who had been brought up tame among people who had the uſe of ſpeech, and who conſequently muſt know the advantage of it. And I can have as little doubt that Mr Braidwood could have taught the oran-outang in Sir Aſhton Lever's collection, who learned to articulate a few words, ſo as to ſpeak plainly enough."

St PETER, Le Port, a market-town of England, in the ſouth-eaſt part of Guernſey, in Hampſhire, in the Britiſh channel, conſiſting of only one long and narrow ſtreet. The mouth of the harbour is well ſet with rocks, and is on each ſide defended by a caſtle; one called the *Old caſtle*, and the other *Caſtle-cornet*. The governor of the iſland generally reſides here, who has the command of the garriſon in this and all the other caſtles. The harbour has a good road, from whence ſhips may ſail with any wind, and from the road paſs under the guns of the caſtle to the pier, cloſe up to the town. The pier is a noble work, formed of vaſt ſtones, joined together with great art and regularity; it is not only a ſecurity to the ſhips, but, being contiguous to the town, is handſomely paved at the top with large ſmooth flagſtones, guarded with parapets, and, being of a great length and breadth, forms a pleaſant walk, affording a free proſpect of the ſea and the neighbouring iſlands. Cornet-caſtle, which commands both the town and the harbour, ſtands on a rock, ſeparated from the land by an arm of the ſea, no leſs than 600 yards wide, and not fordable but at low water in great ſpring-tides.

St PETER's iſland, in the lake of Bienne in Switzerland, remarkable for being one of the retreats of Rouſſeau; whence it has alſo got the name of *Rouſſeau's iſland*. It lies towards the ſouth ſide of the lake, and produces a great variety of ſhrubs and trees, particularly large oaks, beech, and Spaniſh cheſnut. The ſouthern ſhore ſlopes gradually to the lake, and is covered with herbage; the remaining borders are ſteep and rocky; their ſummits in a few places thinly covered with ſhrubs; in others their perpendicular ſides are clothed to the water's edge with hanging woods. The views from the different parts of the iſland are beautiful and diverſified; that to the north being the moſt extenſive and pleaſing. It commands the proſpect of the lake, which is of an oval form; its cultivated borders, interſperſed with villages and caſtles, with the towns of Nidau and Bienne ſtanding upon the farther extremity. Agreeable walks are carried through the woods, and terminate in a circular pavilion placed in the centre of the iſland. Before the troubles in France, on Sunday, and particularly the vintage-time, this iſland was filled with

(B) Lord Monboddo, far from thinking ſpeech or articulation natural to man, rather wonders how he can by any teaching or imitation attain to the ready performance of ſuch various and complicated operations. Add to this, when the organs are completely formed to one language, how hard it is to make them anſwer another.

with parties who amufed themfelves with wandering about the woods or dancing in the circular pavilion. How they employ themfelves now it is not fo eafy to fay, as it was overrun and fubjected by the forces of that unhappy nation, and of courfe tainted with their deftructive principles. It was retaken by the Spaniards, and properly belongs to the king of Sardinia. There is only one farm-houfe on the ifland, in an apartment of which Rouffeau was lodged.

PETER-Pence, was an annual tribute of one penny, paid at Rome out of every family at the feaft of St Peter. And this Ina the Saxon king, when he went in pilgrimage to Rome about the year 740, gave to the pope, partly as alms and partly in recompenfe of a houfe erected in Rome for Englifh pilgrims. And this continued to be paid generally until the time of King Henry VIII. when it was enacted, that from henceforth no perfon fhall pay any penfions, Peter-pence, or other impofitions, to the ufe of the bifhop or fee of Rome.

PETERBOROUGH, a city of Northamptonfhire, about 82 miles from London. It is the leaft city except perhaps Ely, and unqueftionably the pooreft bifhopric, though one of the oldeft towns in England. It had a monaftery dedicated to St Peter, and founded as early as the year 655, to which the abbot of Croyland and his monks flying for protection in the year 870, they were overtaken and murdered in a court of this monaftery, called the *monks churchyard*, becaufe they were all buried here; and to this day is to be feen the tombftone with their effigies, which had been erected over their common grave. Soon after this the Danes deftroyed both the monaftery and friars, fo that it lay deftitute for above 100 years. The monks were, however, reftored, and lived very fumptuoufly, with a mitred abbot at their head, till the reformation, when Henry VIII. converted it into a bifhop's fee. The cathedral, which is faid to be more than 1000 years old, though apparently more modern, is a moft noble Gothic fabric, and was much more fo before it was defaced in the civil wars. The weft front, which is 156 feet broad, is very ftately; and befides columns curioufly adorned, is fupported by three of the talleft arches in Britain. The windows of the cloifters are finely ftained with fcripture hiftory and the fucceffion of its abbots. There are in the church monuments of Queen Catherine, wife of Henry VIII. and of Mary queen of Scots; and the figure of one Mr Scarlet the fexton, who buried them, and lived to 95, after he had buried all the houfekeepers of the town twice over. There is but one parifh-church befides the cathedral. The city is governed by a mayor, recorder, and aldermen, by a charter of Henry VIII. All its officers are elected by the dean and chapter, confifting of fix prebendaries, who are all lords of the manor. Befides the dean and chapter, who are an ecclefiaftical corporation diftinct from the bifhop, there are eight petty canons, four ftudents in divinity, one epiftler, one gofpeller, a fubdean, fubtreafurer, and chanter, eight choristers, eight finging men, two chancellors, befides a fteward, organift, &c. a grammar fchool, and two charity fchools. The river Nen, over which there is here a wooden bridge, is navigable by barges to Northampton, 50 miles further, which bring coal, corn, &c. and by which they export in fome years 6000 quarters of malt, befides other goods, efpecially the woollen manufactures either of cloth or ftockings, in which the poor are employed. The air of Peterborough is faid not to be very wholefome, by reafon of the neighbouring fens; but the water of the river is frefh and good, the higheft fpring-tide never coming up within five miles of the town; and there is plenty of excellent water in their wells. The ftreets are poor, and the houfes but mean; there is, however, a handfome market-houfe, over which are kept the affizes and feffions. Its jurifdiction extends over 32 towns and hamlets, wherein the civil magiftrates appointed by the royal commiffion are vefted with the fame power as judges of affize, and hold their quarterly feffions in this city. The number of inhabitants in 1801 was 3449.

PETERHEAD, a town in Scotland, in the county of Aberdeen, lies about 30 miles north-eaft of that city. It ftands on the moft eafterly point in Scotland, and from thence due weft that kingdom is broadeft.

Peterhead is the neareft land to the northern continent of Europe, and lies within 300 miles of the *cape*, which is called the *Naze of Norway*. Through this channel the grand body of the herrings pafs in their annual migrations from Shetland and the north feas to the more fouthern latitudes, attended with the all-devouring cod and ling; on which account Peterhead, or, as it is fometimes called, *Buchannefs*, hath always been the fecond ftation of the Dutch buffes after leaving the Shetland iflands. Tradition fays, that fome hundred years ago the Dutch offered Lord Marefchal, then the proprietor of the coaft, to cover a fmall ifland called *Inch-Keith* with filver for the property of it to carry on their fitheries, which for obvious reafons could not be accepted. Be that as it may, the Dutch, in time of peace, ftill frequent the coaft in July and Auguft, and fometimes 100 fail are feen within fight of land, bufily employed in the herring and white fifheries. The natives, to whom this treafure properly belongs, have lately made fome attempts towards the white fifhery, of which they cure and vend, chiefly at the London market, 4000 barrels of delicate fmall cod and ling annually. They alfo fit out fome veffels for the Hebride fifhery off Barrahead for the Barcelona market; and they claim the merit of having taught the iflanders how to take and cure the large fifh which abound on their coafts. They have often gained the higheft premiums allowed by government for curing white fifhes.

Few harbours in Great Britain are of more importance to navigation than this of Peterhead, as, in cafe of violent ftorms from the eafterly points, large veffels embayed betwixt this and the mouth of the Forth have not a port that they can fafely take at every time of the tide, that of Aberdeen excepted. If therefore they cannot make their way to fea in the teeth of a ftrong eafterly wind, or double this headland that they may gain the Murray frith, they muft inevitably come on fhore. This harbour lies on a fpacious bay, where veffels of any burden may ride in all other winds, and is therefore the general rendezvous of the fhipping which frequent the northern feas, where they caft anchor on clean ground, and ride fafely till the ftorms have abated. But though nature hath done fo much for the benefit of navigation, fomething is left for the exercife of human aid. The harbour can at prefent contain in perfect fafety 40 or 50 fail of veffels drawing 12 feet water, and is capable of being extended fo as to admit a greater number of fhips drawing 20 feet; by which means not only cafual merchantmen but fmall fhips of war with their convoys

 would

Peterhead, Peterhoff.

would find this a most desirable refuge when pursued by superior force. The harbour is defended by a good battery. A considerable trade is carried on from this place directly to the Baltic for deals, iron, hemp, tar, and other articles. There is also a manufacture of sewing thread, which employs many young girls. A mineral well in the summer-months gives great gaiety to the place; its salutary virtues have long, and we believe very justly, been celebrated. The waters of this spring are powerfully diuretic, and are thought to be efficacious in removing complaints in the bowels.

Twelve pounds avoirdupois of this water were analyzed by Dr Laing, who found it composed of

Muriate of iron,	30.75 grains.
Carbonate of iron,	3.25
Muriate of lime,	7.00
Siliceous earth,	2.00
Sulphate of lime,	2.00
——— soda,	13.25
Muriate of soda,	7.5

Carbonic acid gas, 83.5 cubic inches. The ingenious author of the above analysis recommends this water very much in cases of scrofula. Its most valuable property is tonic, which is no doubt derived from the iron that enters into its composition.

There are here many elegant houses for the accommodation of strangers. There is also a ball-room, under which there are two salt-water baths. These baths are much frequented in nervous disorders: their effect in strengthening the constitution is often surprising. Owing to the open peninsulated situation, the air of this place is esteemed peculiarly pure and healthful; even the fogs rising from the sea are thought to be medicinal: the town is therefore much enlivened by the concourse of company who frequent it on these accounts. Upon the whole, the town is neat and well built, the houses are handsome, and the streets tolerably spacious and very clean; and it has every appearance of a thriving, plentiful, and happy place. In 1793, the population was 4100, being an increase of 1613, since 1755; and in 1801, the numbers had increased to 4491.

PETERHOFF, in Russia, is situated about 20 miles from Petersburg, and is distinguished for its palace and gardens. The palace was begun by Peter I. and finished by Elizabeth. As it is placed upon an eminence, it commands a most superb view of Cronstedt, Petersburg, the intervening gulf, and the opposite coast of Carelia. The palace is most magnificently furnished, and the suite of apartments are truly princely. The presence-chamber is richly ornamented with portraits of the sovereigns of the house of Romanof, who have reigned in Russia since 1613.

Coxe's Travels, vol. i. p. 485.

"The gardens of Peterhoff (says an intelligent traveller) have been celebrated for their taste and elegance; and from the number of jet d'eaus, fountains, basons, cascades, parterres, &c. they have been compared to those of Versailles: and indeed in one respect they are far superior; for the water-works of the latter only play upon particular occasions, while those of Peterhoff are perennial. These gardens, which at the time of their formation were greatly admired in this country, though not congenial to the taste of the empress, are suffered to remain in their present state; as during summer her majesty principally resides at Tzarskoe-Selo, where the grounds are disposed in a more modern and pleasing manner." A vast number of silver dolphins and gilded statues are scattered through them; but the most remarkable figures are those of two gladiators placed in a bason of water. These are represented, not with the sword and buckler, the ancient implements of war, but with a brace of pistols. These they point to each other in a threatening posture, while the water gushes impetuously from the barrels. In that part of the garden which lies between the palace and the gulf, close to the water, is a building which was the favourite retreat of Peter I. It is preserved together with its furniture entirely in its original state with a kind of religious veneration. Its plainness shows the frugal simplicity in which that monarch was accustomed to live. In the same celebrated gardens there is a remarkable building called the *mountain for sledges*, and often by travellers the *flying mountain*. "It stands (says Mr Coxe) in the middle of an oblong area, inclosed by an open colonnade, with a flat roof, which is railed for the convenience of holding spectators. The circumference of this colonnade is at least half a mile. In the middle of the area stands the flying mountain, stretching nearly from one end to the other. It is a wooden building, supported upon pillars, representing an uneven surface of ground, or a mountain composed of three principal ascents, gradually diminishing in height, with an intermediate space to resemble valleys: from top to bottom is a floored way, in which three parallel grooves are formed. It is thus used: a small carriage containing one person being placed in the centre groove upon the highest point, goes with great rapidity down one hill; the velocity which it acquires in its descent carries it up a second; and it continues to move in a similar manner until it arrives at the bottom of the area, where it rolls for a considerable way on the level surface, and stops before it attains the boundary: it is then placed in one of the side grooves, and drawn up by means of a cord fixed to a windlass. To a person unacquainted with the mechanism, this entertainment would appear tremendous; but as the grooves always keep the carriage in its right direction, there is not the least danger of being overturned. At the top of the mountain is a handsome apartment for the accommodation of the court and principal nobility; there is also room for many thousand spectators within the colonnade and upon its roof. Near the flying mountain is a spacious amphitheatre, in which tournaments are usually exhibited."

Peterhoff ‖ Petersburg.

PETERS, Father, a Jesuit, was confessor and counsellor to James II. king of England. This prince dismissed him in 1688, because he was considered as the author of those troubles in which the kingdom was then involved. "He was (says Bishop Burnet) the most violent of the king's advisers, and the person most listened to. Though he had the honour of being nobly descended, he was a man of no extensive erudition, and was eminent only for his bigotry and forwardness." Though Burnet is not always to be believed, yet certain it is, from the testimony of other historians, that Father Peters was by no means a person properly qualified to direct King James in the critical situation in which he then stood.

PETERSBURG, St, a city of the province of Ingria in Russia, and capital of the whole empire. It is situated in N. Lat. 59. 26. 23. and E. Long. 30. 25. from

Petersburg. from the first meridian of Greenwich. It was founded in the year 1703 by Czar Peter the Great, whose ambition it was to have a fleet on the Baltic; for which reason he determined to found a city which might become the centre of trade throughout all his dominions. The spot he pitched upon was a low, fenny, uncultivated island, formed by the branches of the river Neva, before they fall into the gulf of Finland. In the summer this island was covered with mud; and in winter became a frozen pool, rendered almost inaccessible by dreary forests and deep morasses, the haunts of bears, wolves, and other savage animals. Having taken the fort of Nattebourg, and the town of Neischanz, in the year 1703, this mighty conqueror assembled in Ingria above 300,000 men, Russians, Tartars, Cossacks, Livonians, and others, even from the most distant parts of his empire, and laid the foundation of the citadel and fortifications, which were finished in four months, almost in despite of nature. He was obliged to open ways through forests, drain bogs, raise dykes, and lay causeways, before he could pretend to found the new city. The workmen were ill provided with necessary tools and implements, such as spades, pick-axes, shovels, planks, and wheel-barrows: they were even obliged to fetch the earth from a great distance in the skirts of their garments, or in little bags made of old mats and rags sewed together. They had neither huts nor houses to shelter them from the severity of the weather: the country, which had been desolated by war, could not accommodate such a multitude with provisions; and the supplies by the lake Ladoga were often retarded by contrary winds. In consequence of these hardships, above 100,000 men are said to have perished: nevertheless the work proceeded with incredible vigour and expedition; while Peter, for the security of his workmen, formed a great camp, in such a manner, that his infantry continued in Finland, and his cavalry were quartered in Ingria. Some Swedish cruizers being descried in the neighbourhood, the czar posted a body of troops in the isle of Rutzari, by whom the Swedes were repulsed, and the work met with no farther interruption. The buildings of the city kept pace with the fortress, which is the centre of the town, surrounded on all sides by the Neva; and in little more than a year, above 30,000 houses were erected. At present there may be about double that number in Petersburg, though many of them are paultry and inconsiderable. In order to people this city, Peter invited hither merchants, artificers, mechanics, and seamen, from all the different countries of Europe: he demolished the town of Nieuschants, and brought hither not only the materials of the houses, but the inhabitants themselves. A thousand families were drawn from Moscow; he obliged his nobility to quit their palaces and their villas in and about Moscow, and take up their residence at Petersburg, in a much more cold and comfortless climate. Finally, resolving to remove hither the trade of Archangel, he issued an ordonnance, importing, that all such merchandise as had been conveyed to Archangel, in order to be sold to foreigners, should now be sent to Petersburg, where they should pay no more than the usual duties. These endeavours and regulations have rendered this one of the greatest and most flourishing cities in Europe. The Russian boyars and nobility have built magnificent palaces, and are now reconciled to their situation. At first many houses were built of timber; but these being subject to sudden conflagrations in spite of all the precautions that could be taken, the czar, in the year 1714, issued an order, that all new houses should be walled with brick and covered with tiles. The fort is an irregular hexagon, with opposite bastions. This, together with all the rest of the fortifications, was in the beginning formed of earth only; but in the sequel they were faced with strong walls, and provided with casemates, which are bomb-proof. In the curtain of the fort, on the right hand side, is a noble dispensary, well supplied with excellent medicines, and enriched with a great number of porcelain vases from China and Japan. From one of the gates of the fort a draw-bridge is thrown over an arm of the river, in which the czar's galleys and other small vessels are sheltered in the winter. The most remarkable building within the fort is the cathedral, built by the direction of an Italian architect. Petersburg is partly built on little islands, some of which are connected by draw-bridges; and partly on the continent. In the highest part, on the bank of the Neva, the czar fixed his habitation, or ordinary residence, built of free-stone, and situated so as to command a prospect of the greater part of the city. Here likewise is a royal foundery; together with the superb houses of many noblemen. The marshy ground on which the city is built, being found extremely slippery, dirty, and incommodious, the czar ordered every inhabitant to pave a certain space before his own door. In the year 1716, Peter, taking a fancy to the island Wasili-Osterno, which he had given as a present to Prince Menzikoff, resumed the grant, and ordered the city to be extended into this quarter. He even obliged the boyars, or nobles, to build stone-houses on this spot, though they were already in possession of others on the side of Ingria: accordingly this is now the most magnificent part of the city. On the other side of a branch of the Neva stands the czar's country or summer palace, provided with a fine garden and orangery. On the bank of the same river is the slaboda, or suburbs, in which the Germans generally chuse their habitation. Petersburg is very much subject to dangerous inundations. In the year 1715, all the bastions and draw-bridges were either overwhelmed or carried away. The breadth, depth, and rapidity of the Neva, have rendered it extremely difficult, if not impracticable, to join the islands and the continent by bridges. Besides, Peter was averse to this expedient for another reason; resolved to accustom his subjects to navigation, he not only rejected the project of a bridge, but also ordered that no boat should pass between the islands and continent, except by the help of sails only. In consequence of this strange regulation, many lives were lost: but at length he gained his point; and by habituating his sluggish Muscovites to the dangers of the sea, in a little time produced a breed of hardy sailors. The adjacent country is so barren, that the town must be supplied with provisions from a great distance; consequently they are extremely dear. Here are woods in plenty, consisting of pine, fir, alder, birch, poplar, and elm; but the oak and the beech are generally brought from Casan. In winter the weather is extremely cold, and hot in the summer. In June the length of the night does not exceed three hours, during which the

Peterſburg. natives enjoy a continued twilight: but in December the ſun is not viſible more than three hours above the horizon.

The czar Peter, who was indefatigable in his endeavours to improve and civilize his ſubjects, neglected nothing which he thought could contribute to theſe purpoſes. He condeſcended even to inſtitute and regulate aſſemblies at Peterſburg: theſe were opened at five in the afternoon, and the houſe was ſhut at ten: between theſe hours the faſhionable people of both ſexes met without ceremony, danced, converſed, or played either at cards or at cheſs, this laſt being a favourite diverſion among the Ruſſians. There was likewiſe an apartment appointed for drinking brandy and ſmoking tobacco. Plays and operas were likewiſe introduced for the ſame purpoſes; but as Peter had little reliſh, and leſs taſte, for thoſe entertainments, they were performed in a very awkward manner in his lifetime: however, ſince his death theſe performances have been brought to a greater degree of art and decorum.

This great northern legiſlator eſtabliſhed, in the neighbourhood of Peterſburg, manufactures of linen, paper, ſaltpetre, ſulphur, gunpowder, and bricks, together with water-mills for ſawing timber. He inſtituted a marine academy, and obliged every conſiderable family in Ruſſia, to ſend at leaſt one ſon or kinſman, between the ages of ten and eighteen, to this ſeminary, where he was inſtructed in navigation, learned the languages, was taught to perform his exerciſes, and to live under the ſevereſt diſcipline. To crown his other plans of reformation, he granted letters patent for founding an academy, upon a very liberal endowment; and though he did not live to execute this ſcheme, his empreſs, who ſurvived him, brought it to perfection. It was modelled on the plans of the Royal Society in London, and the academy of France. Mr Bullfinger opened it in the year 1726, with an eloquent ſpeech on the deſign and utility of an academy of ſciences; and the profeſſors, who have always diſtinguiſhed themſelves by their merit and erudition, publiſhed an annual collection of their tranſactions; a taſk the more eaſy, as they have the benefit of printing preſſes, well managed, at Peterſburg.

Peter the great has been much cenſured for transferring the ſeat of the empire from Moſcow to St Peterſburg; the former of which lay nearer to the centre of his dominions. But theſe objections will have but little weight with thoſe who conſider the conſequences of the removal. The new city is nearer than Moſcow was to the more civilized parts of Europe; and from an intercourſe with them the manners of the Ruſſians have been improved, and the nobility in particular have loſt much of their feudal importance. Above all, the grand object of Peter, that of having a formidable navy in the Baltic has certainly been obtained, and the empreſs of Ruſſia is now the arbitreſs of the north, and in ſome degree the mediatrix of all Europe. In ſhort, the erection of St Peterſburg was perhaps one of the beſt acts of Peter's reign, and has in its conſequences been the moſt beneficial. Indeed it is at leaſt probable, that if through any revolution the ſeat of government ſhould be again transferred to Moſcow, we ſhould nowhere ſee the traces of thoſe memorable improvements, which the paſſing century has given birth to, but in the annals of hiſtory; and Ruſſia would again, in all probability, relapſe into her original barbariſm.

The erection of ſuch a city as Peterſburg in ſo ſhort a time is truly wonderful. Mr Coxe ſays his mind was filled with aſtoniſhment, when he reflected that ſo late as the beginning of the 18th century the ground on which it ſtands was one vaſt moraſs, occupied by a very few fiſhermen's huts. The preſent diviſions of the town, ſome of which we have already mentioned, are called, 1. The Admiralty quarter; 2. The Vaſſili Oſtrof or Iſland; 3. The Fortreſs; 4. The iſland of St Peterſburg; and, 5. The various ſuburbs of Livonia, of Moſcow, of Alexander Nevſki, and Wiburg.

The late empreſs has done ſo much for this city, that ſhe may not improperly be called its ſecond foundreſs. It is, nevertheleſs, ſtill an infant place, and, as Mr Wraxall obſerves, "only an immenſe outline, which will require future empreſſes, and almoſt future ages, to complete."

"The ſtreets in general, ſays a late traveller, are broad and ſpacious; and three of the principal ones, which meet in a point at the admiralty, and reach to the extremities of the ſuburbs, are at leaſt two miles in length. Moſt of them are paved; but a few are ſtill ſuffered to remain floored with planks. In ſeveral parts of the metropolis, particularly in the Vaſſili Oſtrof, wooden houſes and habitations, ſcarcely ſuperior to common cottages, are blended with the public buildings; but this motley mixture is far leſs common than at Moſcow, where alone can be formed any idea of an ancient Ruſſian city. The brick houſes are ornamented with a white ſtucco, which has led ſeveral travellers to ſay that they are built with ſtone; whereas, unleſs I am greatly miſtaken, there are only two ſtone ſtructures in all Peterſburg. The one is a palace, building by the empreſs upon the banks of the Neva, called *the marble palace*; it is of hewn granite, with marble columns and ornaments; the other is the church of St Iſaac, conſtructed with the ſame materials, but not yet finiſhed. *Coxe's Travels.*

"The manſions of the nobility are many of them vaſt piles of building, but are not in general upon ſo large and magnificent a ſcale as ſeveral I obſerved at Moſcow: they are furniſhed with great coſt, and in the ſame elegant ſtyle as at Paris or London. They are ſituated chiefly on the ſouth ſide of the Neva, either in the Admiralty quarter, or in the ſuburbs of Livonia and Moſcow, which are the fineſt parts of the city." See NEVA.

"Peterſburg, although it is more compact than the other Ruſſian cities, and has the houſes in many ſtreets contiguous to each other, yet ſtill bears a reſemblance to the towns of this country, and is built in a very ſtraggling manner. By an order lately iſſued from government, the city has been incloſed within a rampart, the circumference whereof is 21 verſts, or 14 Engliſh miles."

The ſame accurate obſerver calculates the number of inhabitants at Peterſburg, and makes the medium number 130,000.

We have already ſaid that Peterſburg is very liable to be inundated. An inundation of a very alarming nature took place when Mr Coxe was there in September 1777, of which the following account was given in Journal St Peterſburg, September 1777: "In the evening of the 9th, a violent ſtorm of wind blowing at firſt S. W. and afterwards W. raiſed the Neva and its various branches to ſo great a height, that at five in the

Petersburg. the morning the waters poured over their banks, and suddenly overflowed the town, but more particularly the Vassili Ostrof and the island of St Petersburg. The torrent rose in several streets to the depth of four feet and a half, and overturned, by its rapidity, various buildings and bridges. About seven, the wind shifting to N. W. the flood fell as suddenly; and at mid-day most of the streets, which in the morning could only be passed in boats, became dry. For a short time, the river rose 10 feet 7 inches above its ordinary level."

Mr Kraft, professor of experimental philosophy to the Imperial Academy of Sciences, has written a judicious treatise upon the inundation of the Neva, from which the following observations were extracted by Mr Coxe: "These floods are less alarming than formerly, as the swelling of the river to about six feet above its usual level, which used to overflow the whole town, has no longer any effect, excepting upon the lower parts of Petersburg; a circumstance owing to the gradual raising of the ground by buildings and other causes.

"Upon tracing the principal inundations, the professor informs us that the most ancient, of which there is any tradition, happened in 1691, and is mentioned by Weber, from the account of some fishermen inhabiting near Niefchants, a Swedish redoubt upon the Neva, about three miles from the present fortress of Petersburg. At that period the waters usually rose every five years; and the inhabitants of that district no sooner perceived the particular storms which they had been taught from fatal experience to consider as forerunners of a flood, than they took their hovels to pieces, and, joining the timbers together in the form of rafts, fastened them to the summits of the highest trees, and repaired to the mountain of Duderof, which is distant six miles from their place of abode, where they waited till the waters subsided.

"The highest inundations, excepting the last of 1777, were those of the 1st of November 1726, when the waters rose 8 feet 2 inches; and on the 2d of October 1752, when they rose 8 feet 5 inches.

"From a long course of observations the professor draws the following conclusion. The highest floods, namely, those which rise about six feet, have generally happened in one of the last four months of the year: no sensible effect is ever produced by rain or snow; a swell is sometimes occasioned by the accumulation of masses of ice at the mouth of the Neva; but the principal causes of the overflowing of that river are derived from violent storms and winds blowing south-west or north-west, which usually prevail at the autumnal equinox; and the height of the waters is always in proportion to the violence and duration of those winds. In a word, the circumstances most liable to promote the overflowings of the Neva, are when, at the autumnal equinox, three or four days before or after the full or new moon, that luminary being near her perigæum, a violent north-west wind drives the waters of the northern ocean, during the influx of the tide, into the Baltic, and is accompanied, or instantaneously succeeded by a south-west wind in that sea and the gulf of Finland. All these circumstances concurred at the inundation of 1777: it happened two days before the autumnal equinox, four before the full moon, two after her passing through the perigæum, and by a storm at south-west, which was preceded by strong west winds in the northern ocean, and strong north winds at the mouth of the Baltic." Petersburg.

See *Notices et Remarques sur les debordemens de la Neva à St Petersbourg, accompagnées d'une carte representant la crue et la diminution des eaux*, &c. in Nov. Act. Pet. for 1777, Par. II. p. 47. to which excellent treatise we would refer the curious reader for further information.

All our readers have unquestionably heard of the equestrian statue of Peter I. in bronze. We shall give an account of that extraordinary monument in Mr Coxe's own words. "It is (says he) of a colossal size, and is the work of Monsieur Falconet, the celebrated French statuary, cast at the expence of Catherine II. in honour of her great predecessor, whom she reveres and imitates. It represents that monarch in the attitude of mounting a precipice, the summit of which he has nearly attained. He appears crowned with laurel, in a loose Asiatic vest, and sitting on a housing of bear-skin: his right hand is stretched out as in the act of giving benediction to his people; and his left holds the reins. The design is masterly, and the attitude is bold and spirited. If there be any defect in the figure, it consists in the flat position of the right hand; and for this reason, the view of the left side is the most striking, where the whole appearance is graceful and animated. The horse is rearing upon its hind legs; and its tail, which is full and flowing, slightly touches a bronze serpent, artfully contrived to assist in supporting the vast weight of the statue in due equilibrium. The artist has, in this noble essay of his genius, represented Peter as the legislator of his country, without any allusion to conquest and bloodshed; wisely preferring his civil qualities to his military exploits. The contrast between the composed tranquillity of Peter (though perhaps not absolutely characteristic) and the fire of the horse, eager to press forwards, is very striking. The simplicity of the inscription corresponds to the sublimity of the design, and is far preferable to a pompous detail of exalted virtues, which the voice of flattery applies to every sovereign without distinction. It is elegantly finished in brass characters, on one side in Latin, and on the opposite in Russian. *Petro primo Catherina secunda*, 1782; i. e. Catherine II. to Peter I.

"The statue, when I was at Petersburg, was not erected, but stood under a large wooden shed near the Neva, within a few yards of its enormous pedestal. When Falconet had conceived the design of his statue, the base of which was to be formed by a huge rock, he carefully examined the environs of Petersburg, if, among the detached pieces of granite which are scattered about these parts, one could be found of magnitude correspondent to the dimensions of the equestrian figure. After considerable research, he discovered a stupendous mass half buried in the midst of a morass. The expence and difficulty of transporting it were no obstacles to Catherine II. By her order the morass was immediately drained, a road was cut through a forest, and carried over the marshy ground; and the stone which, after it had been somewhat reduced, weighed at least 1500 tons, was removed to Petersburg. This more than Roman work was, in less than six months from the time of its first discovery, accomplished by a windlass, and by means of large friction balls

alternately

Peterſburg. alternately placed and removed in grooves fixed on each ſide of the road. In this manner it was drawn, with 40 men ſeated upon its top, about four miles, to the banks of the Neva; there it was embarked in a veſſel conſtructed on purpoſe to receive it, and thus conveyed about the ſame diſtance by water to the ſpot where it now ſtands. When landed at Peterſburg, it was 42 feet long at the baſe, 36 at the top, 21 thick, and 17 high; a bulk greatly ſurpaſſing in weight the moſt boaſted monuments of Roman grandeur, which, according to the fond admirers of antiquity, would have baffled the ſkill of modern mechanics, and were alone ſufficient to render conſpicuous the reign of the moſt degenerate emperors.

"The pedeſtal, however, though ſtill of prodigious magnitude, is far from retaining its original dimenſions, as, in order to form a proper ſtation for the ſtatue, and to repreſent an aſcent, the ſummit whereof the horſe is endeavouring to attain, its bulk has been neceſſarily diminiſhed. But I could not obſerve, without regret, that the artiſt has been deſirous to improve upon nature; and, in order to produce a reſemblance of an abrupt broken precipice, has been too laviſh of the chiſſel. Near it was a model in plaſter, to the ſhape of which the workmen were faſhioning the pedeſtal. It appeared to me, that in this model the art was too conſpicuous; and that the effect would have been far more ſublime, if the ſtone had been left as much as poſſible in its rude ſtate, a vaſt unwieldy ſtupendous maſs. And indeed, unleſs I am greatly miſtaken, the pedeſtal, when finiſhed according to this plan, will have ſcarcely breadth ſufficient to afford a proper baſe for a ſtatue of ſuch coloſſal ſize.

"The ſtatue was erected on the pedeſtal on the 27th of Auguſt 1782. The ceremony was performed with great ſolemnity, and was accompanied with a ſolemn inauguration. At the ſame time the empreſs iſſued a proclamation, in which, among other inſtances of her clemency, ſhe pardons all criminals under ſentence of death; all deſerters who ſhould return to their reſpective corps within a limited time; and releaſes all criminals condemned to hard labour, provided they had not been guilty of murder."

Mr Coxe informs us, that the weather is extremely changeable in this capital, and the cold is at times extreme; againſt which the inhabitants take care to provide (ſee PEASANT), though ſome of them nevertheleſs unfortunately fall victims to it. "As I traverſed the city, (ſays Mr Coxe), on the morning of 12th January, I obſerved ſeveral perſons whoſe faces had been bitten by the froſt: their cheeks had large ſcars, and appeared as if they had been ſinged with an hot iron. As I was walking with an Engliſh gentleman, who, inſtead of a fur cap, had put on a common hat, his ears were ſuddenly frozen: he felt no pain, and would not have perceived it for ſome time, if a Ruſſian, in paſſing by, had not informed him of it, and aſſiſted him in rubbing the part affected with ſnow, by which means it was inſtantly recovered. This, or friction with flannels, is the uſual remedy; but ſhould the perſon in that ſtate approach the fire, or dip the part in warm water, it immediately mortifies and drops off.—The common people continued at their work as uſual, and the drivers plied in the ſtreets with their ſledges ſeemingly unaffected by the froſt; their beards were incruſted with clotted ice, and the horſes were covered with iſicles. Peterſburg.

"It ſometimes happens that coachmen or ſervants, while they are waiting for their maſters, are frozen to death. In order to prevent as much as poſſible theſe dreadful accidents, great fires of whole trees, piled one upon another, are kindled in the court-yard of the palace and the moſt frequented parts of the town. As the flames blazed above the tops of the houſes, and caſt a glare to a conſiderable diſtance, I was frequently much amuſed by contemplating the picturesque groups of Ruſſians, with their Aſiatic dreſs and long beards, aſſembled round the fire. The centinels upon duty, having no beards, which are of great uſe to protect the glands of the throat, generally tie handkerchiefs under their chins, and cover their ears with ſmall caſes of flannel."

The police of this city has been much admired. This eſtabliſhment conſiſts of a police maſter, two preſidents, the one for criminal, the other for civil caſes, and two conſulters, choſen from the burgher claſs. To this is committed the care to maintain decorum, good order and morals; the attainment of which is thus accompliſhed.

The reſidence is divided into ten departments, each of which has a preſident, who muſt poſſeſs a correct knowledge of the inhabitants in his own department, of which he is regarded as the *cenſor morum*. His houſe muſt be a refuge both night and day for all in diſtreſs; and he muſt not leave the city for two hours under any pretext whatever, without appointing a ſubſtitute to act in his abſence. The conſtables and watchmen of his department are ſubject to his orders; and in the diſcharge of his duty, he has two ſergeants to attend him.

Each department has three, four, or five ſubdiviſions, of which there are 42 in the whole reſidence. Each of theſe has a quarter-inſpector, and under him a quarter-lieutenant. The duty of all theſe is in uniſon with that of the preſident, but the ſphere of their activity is more circumſcribed. They ſettle trivial affairs, and keep a watchful eye over every thing that paſſes.

The night watchmen are 500 in number, who have ſtations aſſigned them, and are to be aided in the ſeizing of offenders, or in any ſervice their commanders may require. There is alſo a command of 120 men, who are ſupported by a regiment of huſſars, ſhould the nature of their duty be at any time ſo hazardous as to render ſuch a meaſure neceſſary.

This piece of political mechaniſm is ſo harmoniouſly connected in all its parts, that it becomes the admiration of every foreigner.

So extraordinary is the vigilance obſerved by every part of this admirable whole, that all ſecret inquiſitions are totally ſuperfluous. The police has a knowledge of every perſon in the reſidence; travellers are ſubject to certain formalities, in conſequence of which to hide the place of their abode, or the time of their departure, are alike impracticable. Every houſeholder muſt declare to the police who lodges with him, or what ſtrangers have put up at his houſe. When travellers leave the town, they muſt publiſh in the newſpapers their name, quality, and place of abode, three different times, and produce the papers containing ſuch advertiſement.

The

The police alfo watches over fecret focieties of every kind, fo that nothing inimical to the exifting government can either be freely difcuffed, or fafely carried into execution. The difturbers of the public peace in this city muft of confequence be few in number.

The court called *oral*, fits every day, and proceeds orally in all the caufes brought before it; keeping at the fame time a day-book, in which the decifions of the court are entered, and every week it is laid before the fitting magiftrate. Every caufe muft be determined in one day, or in three at moft, if the collecting of examinations fhould be intricate and tedious. But fome travellers have given a more unfavourable account of the police of the Ruffian metropolis, and have declared that murder and robbery may fometimes be committed with impunity, if the guilty have it in their power to bribe the watchmen.

PETERSBURGH, in America, is a fea-port town in Virginia, 25 miles fouthward of Richmond, feated on the fouth fide of the Appamatox river, about 12 miles above its junction with James river, and contained nearly 300 houfes in 1787, in two divifions; one is upon a cold clay foil, and is very dirty; the other upon a plain of fand or loam. There is no regularity, and very little elegance in Peterfburgh. It is merely a place of bufinefs. The Free Mafons have a hall tolerably elegant; and the feat of the Bowling family is pleafant and well built. It is very unhealthy. About 2200 hogfheads of tobacco are infpected here annually. Like Richmond, Williamfburgh, Alexandria, and Norfolk, it is a corporation; and what is fingular, Peterfburgh city comprehends part of three counties. The celebrated Indian queen, Pocahonta, from whom defcended the Randolph and Bowling families, formerly refided at this place.

PETERSFIELD, a handfome town of Hampfhire in England, and fends two members to parliament. It is feated in W. Long. 1. 5. N. Lat. 51. 5.

PETERWARADIN, a fortified town in Sclavonia, and one of the ftrongeft frontier places the houfe of Auftria has againft the Turks, feated on the Danube between the Drave and the Save. E. Long. 20. 0. N. Lat. 45. 20.

PETIOLE, in *Botany*, the flender ftalks that fupport the leaves of a plant.

PETIT, or PETITE, a French word fignifying *little* or *fmall*.

PETITE Guerre, denotes the operations of detached parties and the war of pofts. See WAR, Part III.

PETIT Sergeanty. See SERGEANTY.

PETIT Treafon. See TREASON.

PETIT, *John*, a doctor of the Sorbonne, very early gained to himfelf a character by his knowledge, and thofe eloquent orations which he pronounced before the univerfity of Paris. He was employed in the famous embaffy which was fent from France to Rome, for the purpofe of healing the fchifm in 1407; but he foon loft all the honour which he had acquired. John Sans Peur, duke of Burgundy, having treacheroufly contrived to affaffinate Louis of France, duke of Orleans, only brother to Charles VI. John Petit, entirely devoted to the views of the murderer, maintained in a public difputation, at Paris, the 8th of March 1408, that the murder was lawful. He had the effrontery to affert, that "it is allowable to employ fraud, treafon, and every other method, however bafe, in order to get rid of a tyrant; and that no faith ought to be kept with him." He dared to add further, that "the man who fhould commit fuch an action, not only deferved to be exempted from punifhment, but to receive a reward." This fanguinary doctrine was loudly exclaimed againft; but the duke of Burgundy's powerful influence fheltered Petit for fome time. Some eminent writers, however, of that period, with Gerfon at their head, denounced the doctrine to John de Montaigu, bifhop of Paris, who condemned it as heretical the 23d November 1414. It was likewife condemned by the council of Conftance the year following at the inftigation of Gerfon; but no notice was taken either of Petit's name or his writings. In fine, the king, on the 16th of September 1416, ordered the parliament of Paris to pronounce a fevere decree againft this dangerous performance; and it was alfo cenfured by the univerfity. But the duke of Burgundy, in 1418, had intereft enough to compel the grand vicars of the bifhop of Paris, who then lay fick at St Omer's, to retract the fentence which that prelate had paft in 1414. Petit died three years before, i. e. in 1411, at Hefdin; and his apology in favour of the duke of Burgundy, with all the particulars of that infamous tranfaction, may be feen in the fifth volume of the laft edition of Gerfon's works. Father Pinchinat, of the order of St Francis, and author of the Dictionary of Herefies, in 4to, has endeavoured to vindicate his order from a charge brought by fome writers, who have called Petit a *Cordelier*, or *Francifcan friar*. "He proves very clearly (fays Abbé Prevot) that he was a fecular prieft; and adds, that upon the fame evidence, Father Mercier, a Cordelier, had a warm difpute in 1717 with M. Dupin, who had given this title to Petit in his Collection of Cenfures. He reprefented to him (fays he), before a meeting of the Faculty, the falfity of fuch a claim, and the injury which he offered to the order of St Francis. Dupin, convinced of his error, candidly owned that he was led into it by following fome infidel writers, and promifed to retract it in the new edition of the Cenfures, which was publifhed in 1720. M. Fleury, who had committed the fame miftake, promifed alfo to make amends for it by a folemn recantation; but dying before he had an opportunity of doing that piece of juftice to the Cordeliers, the continuator of his Ecclefiaftical Hiftory, who had not fuch opportunities of information, fell into the fame fault." (*Pour & contre*, tom. x. p. 23.). If we take the opinion of L'Advocat's Dictionary, it would appear no fault was committed; for it gives a lift of the penfioners of the dukes of Burgundy, in order to prove that John Petit was a Cordelier. Indeed, it is highly probable that if Dupin, Fleury, and Father Fabré, did not alter their opinion, it was owing to a firm perfuafion that they had committed no error.

PETIT, *John Lewis*, an eminent furgeon, born at Paris in 1674. He had fo early an inclination to furgery, that Mr Littre, a celebrated anatomift, being in his father's houfe, he regularly attended that gentleman's lectures, from his being feven years of age. He was received mafter in furgery in the year 1700; and acquired fuch reputation in the practice of that art, that in 1726 the king of Poland fent for him to his court, and in 1734 the king of Spain prevailed on him to go into that kingdom. He reftored the health of thofe princes;

princes; and they endeavoured to detain him by offering him great advantages, but he chose rather to return to France. He was received into the academy of sciences in 1715; became director of the royal academy of surgery; made several important discoveries; and invented new instruments for the improvement of surgery. He died at Paris in 1750. He wrote an excellent Treatise on the Diseases of the Bones, the best edition of which is that of 1723; and many learned Dissertations in the Memoirs of the Academy of Sciences, and in the first volume of the Memoirs of Surgery.

PETITIO PRINCIPII, in *Logic*, the taking a thing for true, and drawing conclusions from it as such, when it is really false; or at least wants to be proved before any inferences can be drawn from it.

PETITION, a supplication made by an inferior to a superior, and especially to one having jurisdiction. It is used for that remedy which the subject hath to help a wrong done by the king, who hath a prerogative not to be sued by writ: In which sense it is either general, That the king do him right; whereupon follows a general indorsement upon the same, *Let right be done the party*: Or it is special, when the conclusion and indorsement are special, for this or that to be done, &c.

By statute, the soliciting, labouring, or procuring the putting the hands or consent of above twenty persons to any petition to the king, or either house of parliament, for alterations in church or state, unless by assent of three or more justices of the peace of the county, or a majority of the grand jury at the assizes or sessions, &c. and repairing to the king or parliament to deliver such petition with above the number of ten persons, is subject to a fine of 100l. and three months imprisonment, being proved by two witnesses within six months, in the court of *B. R.* or at the assizes, &c. And if what is required by this statute be observed, care must be taken that petitions to the king contain nothing which may be interpreted to reflect on the administration; for if they do, it may come under the denomination of a libel: and it is remarkable, that the petition of the city of London for the sitting of a parliament was deemed libellous, because it suggested that the king's dissolving a late parliament was an obstruction of justice; also the petition of the seven bishops, sent to the Tower by James II. was called a libel, &c. To subscribe a petition to the king, *to frighten him into a change of his measures, intimating, that if it be denied many thousands of his subjects will be discontented*, &c. is included among the contempts against the king's person and government, tending to weaken the same, and is punishable by fine and imprisonment.

PETITORY ACTION, in *Scots Law*. See LAW, N° clxxxiii. 18. 20.

PETITOT, JOHN, a curious painter in enamel, who was born at Geneva in 1607, reached a great degree of perfection in the art. He was wonderfully patient in finishing his works, but he had the address to conceal his labour. He only painted the heads and hands of the figures: the hair, grounds, and drapery, being executed by Bordier his brother-in-law. These two artists had the credit of associating and labouring together for fifty years, without the least misunderstanding between them. It is asserted by an ingenious French writer, that Petitot and Bordier derived the knowledge of the most curious and durable colours proper for enamelling, from Sir Theodore Mayerne at London, who recommended Petitot to Charles I. He had the honour to paint the portraits of that monarch and the whole royal family, and continued in England until Charles's unhappy end: he then went to Paris, where he was highly favoured by Louis XIV. and acquired an ample fortune. Being a Protestant, the revocation of the edict of Nantz obliged him to retire to Geneva; but settling soon after at Veray in the canton of Bern, he passed the remainder of his life in ease and affluence. He died in 1691.

Petitot may be called the inventor of painting portraits in enamel. Though his friend Bordier made several attempts before him, and Sir Theodore Mayerne had facilitated the means of employing the most beautiful colours; yet Petitot completed the works, which under his hand acquired a softness and liveliness of colouring that will never change, and will ever render his works variable. He made use of gold and silver plates, and seldom enamelled on copper. When he first came in vogue, his price was 20 louis's a head, which he soon raised to 40. It was his custom to take a painter with him, who painted the picture in oil; after which Petitot sketched out his work, which he always finished after the life. When he painted the king of France, he took those pictures for his copies that most resembled him; and the king afterwards gave him a sitting or two to finish his work.

PETIVER, JAMES, a celebrated English botanist, was contemporary with Plukenet; but we are wholly unacquainted with the precise time of his birth. He was by profession an apothecary, having served an apprenticeship under Mr Feltham, apothecary to Bartholomew's hospital. He settled in Aldersgate-street when he commenced business on his own account, where he continued during the whole of his life. His business was extensive; and he was afterwards chosen apothecary to the Charter-house. Excepting Sir Hans Sloane, and Mr Courten, he was the only person after the Tradescants, who made any important collections in natural history, previous to those of the present day. He employed the captains and surgeons of different ships to bring him home specimens; and by means of printed directions he enabled them to select proper objects. In this manner his collection soon became so valuable, that he was offered 4000l. for it by Sir Hans Sloane, some time prior to his decease; but, after he died, it was purchased by that naturalist. His fame was extended both at home and abroad by his valuable museum. He was chosen a fellow of the Royal Society; and having become acquainted with Ray, he assisted him in arranging the second volume of his History of Plants. He died on the 20th of April, 1718; and his funeral was honoured by the attendance of Sir Hans Sloane, and other eminent men, as pall-bearers.

He published several works, on different subjects of natural history, such as *Musei Petiveriani Centuriæ decem*, 1692—1703, 8vo: *Gazophylacii Naturæ et Artis, Decades decem*, folio, 1702, with 100 plates: A catalogue of Mr Ray's English Herbal, illustrated with figures, folio, 1713, and continued in 1715: Many small publications, which may be found enumerated in Dr Pultney's book: Many papers in the Philosophical Transactions; and a material article in the third volume of Ray's work, entitled, *Plantæ Rariores Chinenses, Madras-*

Petiver || Petrarch.

Madras-patanæ, et Africanæ, à Jacobo Petivero ad opus consummandum collatæ, &c. Many of his small tracts having become scarce, his works were collected and published, exclusive of his papers in the Transactions, in 2 vols. folio, in the year 1764.

PETIVERIA, a genus of plants belonging to the hexandria class, and in the natural method ranking under the 12th order, *Holoraceæ*. See BOTANY *Index*.

PETRA, (Cæsar, Lucian), a town of Greece, on the coast of Illyricum, near Dyrrhachium, and not far from the mouth of the river Panyasus.—Another PETRA, (Livy); a town of Mædica, a district of Thrace, lying towards Macedonia; but in what part of Macedonia, he does not say.

PETRA (Ptolemy), *Petræa* (Silius Italicus), *Petrina* (Italicus), in both which last *urbs* is understood; an inland town of Sicily, to the south-west of Engyum. Now *Petraglia* (Cluverius).

PETRA Jecktael (2 Kings xiv.), a town of the Amalekites; near the Adscensus Scorpionis (Judges i.) and the valley of Salt in the south of Judea; afterwards in the possession of the Edomites, after destroying the Amalekites.

PETRA Recem, or *Rekem*, so called from Rekem king of the Midianites, slain by the Israelites (Num. xxxi.). Formerly called *Arce*, now *Petra*; the capital of Arabia Petræa (Josephus). Ptolemy places it in Long. 66. 45. from the Fortunate islands, and Lat. 30. 20. It declines therefore 80 miles to the south of the parallel of Jerusalem, and 36 miles, more or less, from its meridian to the east. Josephus says, that the mountain on which Aaron died stood near Petra; which Strabo calls the capital of the Nabatæi; at the distance of three or four days journey from Jericho. This Petra seems to be the Sela of Isaiah xvi. 1. and xlii. 11. the Hebrew name of *Petra*, "a rock:" Though some imagine Petra to be no older than the time of the Macedonians.

PETRARCH, FRANCIS, a celebrated Italian poet, was born at Arezzo in 1304, and was the son of Petraco di Parenzo. He studied grammar, rhetoric, and philosophy, for four years at Carpentras; from whence he went to Montpelier, where he studied the law under John Andreas and Cino of Pistoia, and probably from the latter received a taste for Italian poetry. As Petrarch only studied the law out of complaisance to his father, who on his visiting him at Bologna had thrown in the fire all the Latin poets and orators except Virgil and Cicero; he, at 22 years of age, hearing that his father and mother were dead of the plague at Avignon, returned to that city to settle his domestic affairs, and purchased a country-house in a very solitary but agreeable situation, called *Vaucluse*; where he first knew the beautiful Laura, with whom he fell in love, and whom he has immortalized in his poems. He at length travelled into France, the Netherlands, and Germany; and at his return to Avignon entered into the service of Pope John XXII. who employed him in several important affairs. Petrarch was in hopes of being raised to some considerable posts: but being disappointed, he applied himself entirely to poetry; in which he met with such applause, that in one and the same day he received letters from Rome and the chancellor of the university of Paris, by which they invited him to receive the poetic crown. By the advice of his friends, he preferred Rome to Paris, and received that crown from the senate and people on the 8th of April 1341. "The ceremony of his coronation (says Gibbon) was performed in the Capitol, by his friend and patron the supreme magistrate of the republic. Twelve patrician youths were arrayed in scarlet; six representatives of the most illustrious families, in green robes, with garlands of flowers, accompanied the procession; in the midst of the princes and nobles, the senator, count of Anguillara, a kinsman of the Colonna, assumed his throne; and at the voice of a herald Petrarch arose. After discoursing on a text of Virgil, and thrice repeating his vows for the prosperity of Rome, he knelt before the throne, and received from the senator a laurel crown, with a more precious declaration, 'This is the reward of merit.' The people shouted, 'Long life to the Capitol and the poet!' A sonnet in praise of Rome was accepted as the effusion of genius and gratitude; and after the whole procession had visited the Vatican, the profane wreath was suspended before the shrine of St Peter. In the act or diploma which was presented to Petrarch, the title and prerogatives of poet-laureat are revived in the Capitol after the lapse of 1300 years; and he receives the perpetual privilege of wearing, at his choice, a crown of laurel, ivy, or myrtle; of assuming the poetic habit; and of teaching, disputing, interpreting, and composing, in all places whatsoever, and on all subjects of literature. The grant was ratified by the authority of the senate and people; and the character of citizen was the recompense of his affection for the Roman name. They did him honour, but they did him justice. In the familiar society of Cicero and Livy, he had imbibed the ideas of an ancient patriot; and his ardent fancy kindled every idea to a sentiment, and every sentiment to a passion." His love of solitude at length induced him to return to Vaucluse; but, after the death of the beautiful Laura, Provence became insupportable to him, and he returned to Italy in 1352; when, being at Milan, Galeas Visconti made him counsellor of state. Petrarch spent almost all the rest of his life in travelling to and from the different cities in Italy. He was archdeacon of Parma, and canon of Padua; but never received the order of priesthood. All the princes and great men of his time gave him public marks of their esteem; and while he lived at Arcqua, three miles from Padua, the Florentines deputed Boccace to go to him with letters, by which they invited him to Florence, and informed him, that they restored to him all the estate of which his father and mother had been deprived during the dissensions between the Guelphs and Gibelines. He died a few years after at Arcqua, in 1374. He wrote many works that have rendered his memory immortal; these have been printed in four volumes folio. His life has been written by several authors. Amongst these there was one by Mrs Susanna Dobson, in 2 volumes 8vo, collected and abridged from the French. In this work we have the following elegant and just character of Petrarch.

"Few characters, perhaps, have set in a stronger light the advantages of well-regulated dispositions than that of Petrarch, from the contrast we behold in one particular of his life, and the extreme misery he suffered from the indulgence of an affection, which, though noble and delightful when justly placed, becomes a reproach and a torment to its possessor when once di-

Petrarch. rected to an improper object. For, let us not deceive ourselves or others; though (from the character of Laura) they are acquitted of all guilt in their personal intercourse, yet, as she was a married woman, it is not possible, on the principles of religion and morality, to clear them from that just censure which is due to every defection of the mind from those laws which are the foundation of order and peace in civil society, and which are stamped with the sacred mark of divine authority.

"In this particular of his character, therefore, it is sincerely hoped that Petrarch will serve as a warning to those unhappy minds, who, partaking of the same feelings under the like circumstances, but not yet suffering his misery, may be led, by the contemplation of it, by a generous regard to the honour of human nature, and by a view to the approbation of that all-seeing Judge who penetrates the most secret recesses of the heart, to check every unhappy inclination in its birth, and destroy, while yet in their power, the seeds of those passions which may otherwise destroy them.

"As to the cavils or censures of those who, incapable of tenderness themselves, can neither enjoy the view of it when presented in its most perfect form, nor pity its sufferings when, as in this work, they appear unhappily indulged beyond the bounds of judgment and tranquillity; to such minds I make no address, well convinced, that, as no callous heart can enjoy, neither will it ever be in danger of being misled, by the example of Petrarch in this tender but unfortunate circumstance of his character.

"To susceptible and feeling minds alone Petrarch will be ever dear. Such, while they regret his failings, and consider them as warnings to themselves, will love his virtues; and, touched by the glowing piety and heart-felt contrition which often impressed his soul, will ardently desire to partake with him in those pathetic and sublime reflections which are produced in grateful and affectionate hearts, on reviewing their own lives, and contemplating the works of God.

"Petrarch had received from nature a very dangerous present. His figure was so distinguished as to attract universal admiration. He appears, in his portraits, with large and manly features, eyes full of fire, a blooming complexion, and a countenance that bespoke all the genius and fancy which shone forth in his works. In the flower of his youth, the beauty of his person was so very striking, that wherever he appeared, he was the object of attention. He possessed an understanding active and penetrating, a brilliant wit, and a fine imagination. His heart was candid and benevolent, susceptible of the most lively affections, and inspired with the noblest sentiments of liberty.

"But his failings must not be concealed. His temper was, on some occasions, violent, and his passions headstrong and unruly. A warmth of constitution hurried him into irregularities, which were followed with repentance and remorse.—No essential reproach, however, could be cast on his manners, till after the 23d year of his age. The fear of God, the thoughts of death, the love of virtue, and those principles of religion which were inculcated by his mother, preserved him from the surrounding temptations of his earlier life."

A resemblance has been traced, in several instances, between this admired poet and our late famous Yorick. Petrarch ‖ Petrifaction. —Both, we know, had great wit and genius, and no less imprudence and eccentricity; both were canons, or prebendaries, the Italian of Padua, &c. and the Englishman of York; they both "ran over France, without any business there." If the bishop of Lombes patronised and corresponded with the one, a prelate * of the English church, now deceased, desired, in a letter, to *shandyise* † with the other. In their attachments to Laura and Eliza, both married women, these two prebendaries were equally warm, and equally innocent. And, even after death, a most remarkable circumstance has attended them both; some persons, we are told, stole Petrarch's bones, in order to sell them; and, in like manner, Yorick's body, it is confidently affirmed, was also stolen, and his skull has been exhibited at Oxford.

* Dr Gilbert, Arch. York.

† His Grace's own expression.

PETRE, or SALTPETRE. See NITRE, CHEMISTRY and MINERALOGY *Index*.

PETREA, in *Botany*, a genus of plants belonging to the didynamia class; and in the natural method ranking under the 40th order, *Personatæ*. See BOTANY *Index*.

PETREL. See PROCELLARIA, ORNITHOLOGY *Index*.

PETRIFACTION, in *Natural History*, denotes the conversion of wood, bones, and other substances, principally animal or vegetable, into stone. These bodies are more or less altered from their original state, according to the different substances they have lain buried among in the earth; some of them having suffered very little change, and others being so highly impregnated with crystalline, sparry, pyritical, or other extraneous matter, as to appear mere masses of stone or lumps of the matter of the common pyrites; but they are generally of the external dimensions, and retain more or less of the internal figure, of the bodies into the pores of which this matter has made its way. The animal substances thus found petrified are chiefly sea-shells; the teeth, bony palates, and bones of fish; the bones of land animals, &c. These are found variously altered, by the insinuation of stony and mineral matter into their pores; and the substance of some of them is now wholly gone, there being only stony, sparry, or other mineral matter remaining in the shape and form.

Respecting the manner in which petrifaction is accomplished, we know but little. It has been thought by many philosophers, that this was one of the rare processes of nature; and accordingly such places as afforded a view of it, have been looked upon as great curiosities. However, it is now discovered, that petrifaction is exceedingly common: and that every kind of water carries in it some earthy particles, which being precipitated from it, become stone of a greater or lesser degree of hardness; and this quality is most remarkable in those waters which are much impregnated with selenitic matter. It has been found by observation, that iron contributes greatly to the process: and this it may do by its precipitation of any aluminous earth which happens to be dissolved in the water by means of an acid; for iron has the property of precipitating this earth. Calcareous earth, however, by being soluble in water without any acid, must contribute very much to the process of petrifaction, as they are capable of a great degree of hardness by means only of being joined

Petrifaction.

joined with fixed air, on which depends the solidity of our common cement or mortar used in building houses.

The name *petrifaction* belongs only, as we have seen, to bodies of vegetable or animal origin; and in order to determine their class and genus, or even species, it is necessary that their texture, their primitive form, and in some measure their organization, be still discernible. Thus we ought not to place the stony kernels, moulded in the cavity of some shell, or other organized body, in the rank of petrifactions, properly so called.

Petrifactions of the vegetable kingdom are almost all either gravelly or siliceous; and are found in gullies, trenches, &c. Those which strike fire with steel are principally found in sandy fissures; those which effervesce in acids are generally of animal origin, and are found in the horizontal beds of calcareous earth, and sometimes in beds of clay or gravel; in which case the nature of the petrifaction is different. As to the substances which are found in gypsum, they seldom undergo any alteration, either with respect to figure or composition, and they are very rare.

Organized bodies, in a state of petrifaction, generally acquire a degree of solidity of which they were not possessed before they were buried in the earth, and some of them are often fully as hard as the stones or matrices in which they are enveloped. When the stones are broken, the fragments of petrifactions are easily found, and easily distinguished. There are some organized bodies, however, so changed by petrifaction, as to render it impossible to discover their origin. That there is a matter more or less agitated, and adapted for penetrating bodies, which crumbles and separates their parts, draws them along with it, and disperses them here and there in the fluid which surrounds them, is a fact of which nobody seems to entertain any doubt. Indeed we see almost every substance, whether solid or liquid, insensibly consume, diminish in bulk, and at last, in the lapse of time, vanish and disappear.

A petrified substance, strictly speaking, is nothing more than the skeleton, or perhaps image, of a body which has once had life, either animal or vegetable, combined with some mineral. Thus petrified wood is not in that state wood alone. One part of the compound or mass of wood having been destroyed by local causes, has been compensated by earthy and sandy substances, diluted and extremely minute, which the waters surrounding them had deposited while they themselves evaporated. These earthy substances, being then moulded in the skeleton, will be more or less indurated, and will appear to have its figure, its structure, its size, in a word, the same general characters, the same specific attributes, and the same individual differences. Farther, in petrified wood, no vestige of ligneous matter appears to exist. We know that common wood is a body in which the volume of solid parts is greatly exceeded by that of the pores. When wood is buried in certain places, lapidific fluids, extremely divided and sometimes coloured, insinuate themselves into its pores and fill them up. These fluids are afterwards moulded, and condensed. The solid part of the wood is decomposed and reduced into powder, which is expelled without the mass by aqueous filtrations. In this manner, the places which were formerly occupied by the wood are now left empty in the form of pores. This operation of nature produces no apparent difference either of the size or of the shape; but it occasions, both at the surface and in the inside, a change of substance, and the ligneous texture is inverted; that is to say, that which was pore in the natural wood, becomes solid in that which is petrified; and that which was solid or full in the first state, becomes porous in the second. In this way, says M. Musard, petrified wood is much less extended in pores than solid parts, and at the same time forms a body much more dense and heavy than the first. As the pores communicate from the circumference to the centre, the petrifaction ought to begin at the centre, and end with the circumference of the organic body subjected to the action of the lapidific fluids. Such is the origin of petrifactions. They are organized bodies which have undergone changes at the bottom of the sea or the surface of the earth, and which have been buried by various accidents at different depths under the ground.

In order to understand properly the detail of the formation of petrified bodies, it is necessary to be well acquainted with all their constituent parts. Let us take wood for an example. Wood is partly solid and partly porous. The solid parts consist of a substance, hard, ligneous, and compact, which forms the support of the vegetable; the porous parts consist of vessels or interstices which run vertically and horizontally across the ligneous fibres, and which serve for conducting air, lymph, and other fluids. Among these vessels, the trachiæ which rise in spiral forms, and which contain only air, are easily distinguished. The cylindric vessels, some of which contain lymph, and others the *succus proprius*, are full only during the life of the vegetable. After its death they become vacant by the evaporation and absence of the fluids with which they were formerly filled. All these vessels, whether ascending or descending, unite with one another, and form great cavities in the wood and in the bark. According to Malpighi and Duhamel, the ligneous fibres are themselves tubular, and afford a passage to certain liquors; in short, the wood and bark are interspersed with utriculi of different shapes and sizes. The augmentation of the trunk in thickness, according to Malpighi, is accomplished by the annual addition of a new exterior covering of fibres and of trachiæ. Others think that a concentric layer of sap-wood is every year hardened, whilst a new one is forming from the bark. But it is on all sides agreed that the concentric layers of wood are distinct from one another, because at the point of contact betwixt any two of them, the new vessels, as well as new fibres, are more apparent and perceptible than they are in any other place. Having made these preliminary remarks on the structure of vegetables, we shall now proceed to give an abridged account of the manner in which M. Mongez explains their petrifaction.

In proportion to the tenderness and bad quality of wood, it imbibes the greater quantity of water; therefore this sort will unquestionably petrify more easily than that which is hard. It is thought that all the petrified wood so often found in Hungary has been originally soft, such as firs or poplars. Suppose a piece of wood buried in the earth; if it be very dry, it will suck up the moisture which surrounds it like a sponge. This moisture, by penetrating it, will dilate all the parts of which it is composed. The trachiæ, or air-vessels, will be

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be filled first, and then the lymphatic vessels and those which contain the *succus proprius*, as they are likewise empty. The water which forms this moisture keeps in dissolution a greater or a less quantity of earth; and this earth, detached, and carried along in its course, is reduced to such an attenuated state, that it escapes our eyes and keeps itself suspended, whether by the medium of fixed air or by the motion of the water. Such is the lapidific fluid. Upon evaporation, or the departure of the menstruum, this earth, sand, or metal, again appears in the form of precipitate or sediment in the cavities of the vessels, which by degrees are filled with it. This earth is there moulded with exactness: The lapse of time, the simultaneous and partial attraction of the particles, make them adhere to one another; the lateral suction of the surrounding fibres, the obstruction of the moulds, and the hardening of the moulded earth, become general; and there consists nothing but an earthy substance which prevents the sinking of the neighbouring parts. If the deposit is formed of a matter in general pretty pure, it preserves a whiter and clearer colour than the rest of the wood; and as the concentric layers are only perceptible and distinct in the wood, because the vessels are there more apparent on account of their size, the little earthy cylinders, in the state of petrified wood, must be there a little larger, and consequently must represent exactly the turnings and separations of these layers. At the place of the utriculi, globules are observed, of which the shapes are as various as the moulds wherein they are formed. The anastomoses of the proper and lymphatic vessels, form besides points of support or reunion for this stony substance.

With regard to holes formed by worms in any bits of wood before they had been buried in the earth, the lapidific fluid, in penetrating these great cavities, deposits there as easily the earthy sediment, which is exactly moulded in them. These vermiform cylinders are somewhat less in bulk than the holes in which they are found, which is owing to the retreat of the more refined earth and to its drying up.

Let any one represent to himself this collection of little cylinders, vertical, horizontal, inclined in different directions, the stony masses of utriculi and of anastomoses, and he will have an idea of the stony substance which forms the ground-work of petrifaction. Hitherto not a single ligneous part is destroyed; they are all existing, but surrounded on every side with earthy deposits: and that body which, during life, was composed of solid and of empty parts, is now entirely solid: its destruction and decomposition do not take place till after the formation of these little deposits. In proportion as the water abandons them, it penetrates the ligneous substance, and destroys it by an insensible fermentation. The woody fibres being decomposed, form in their turn voids and interstices, and there remains in the whole piece nothing but little stony cylinders. But in proportion as these woody fibres disappear, the surrounding moisture, loaded with earth in the state of dissolution, does not fail to penetrate the piece of wood, and to remain in its new cavities. The new deposit assumes exactly the form of decomposed fibres; it envelopes in its turn the little cylinders which were formed in their cavities, and ends by incorporating with them. We may suppose here, that in proportion as it decomposes, there is a reaction of the ligneous part against the lapidific fluid: from this reaction a colour arises which stains more or less the new deposit; and this colour will make it easily distinguishable from that which has been laid in the inside of the vessels. In all petrified wood this shade is generally perceptible.

We have then, says M. Mongez, four distinct epochs in the process by which nature converts a piece of wood into stone, or to speak more justly, by which she substitutes a stony deposit in its place: 1. Perfect vegetable wood, that is to say, wood composed of solid and of empty parts, ligneous fibres, and of vessels. 2. Wood having its vessels obstructed and choked up by an earthy deposit, while its solid parts remain unaltered. 3. The solid parts attacked and decomposed, forming new cavities betwixt the stony cylinder, which remain in the same state, and which support the whole mass. 4. These new cavities filled with new deposits, which incorporate with the cylinders, and compose nothing else but one general earthy mass representing exactly the piece of wood.

Among the petrifactions of vegetables called *dendrolites*, are found parts of shrubs, stems, roots, portions of the trunk, some fruits, &c. We must not, however, confound the impressions of mosses, ferns, and leaves, or incrustations, with petrifactions.

Among the petrifactions of animals, we find shells, crustaceous animals, polyparii, some worms, the bony parts of fishes and of amphibious animals, few or no real insects, rarely birds and quadrupeds, together with the bony portions of the human body. The cornu ammonis are petrified shell-fish; and with regard to figured and accidental bodies, these are *lusus naturæ*.

In order, says M. Bertrand, in his *Dictionnaire des Fossiles*, that a body should become petrified, it is necessary that it be, 1. Capable of preservation under ground: 2. That it be sheltered from the air and running water (the ruins of Herculaneum prove that bodies which have no connection with free air, preserve themselves untouched and entire). 3. That it be secured from corrosive exhalations. 4. That it be in a place where there are vapours or liquids, loaded either with metallic or stony particles in a state of dissolution, and which, without destroying the body, penetrate it, impregnate it, and unite with it in proportion as its parts are dissipated by evaporation.

It is a question of great importance among naturalists, to know the time which Nature employs in petrifying bodies of an ordinary size.—It was the wish of the emperor, duke of Lorraine, that some means should be taken for determining this question. M. le Chevalier de Baillu, director of the cabinet of natural history of his imperial majesty, and some other naturalists, had, several years ago, the idea of making a research which might throw some light upon it. His imperial majesty being informed by the unanimous observations of modern historians and geographers, that certain pillars which are actually seen in the Danube in Servia, near Belgrade, are remains of the bridge which Trajan constructed over that river, presumed that these pillars having been preserved for so many ages behoved to be petrified, and that they would furnish some information with regard to the time which nature employs in changing wood into stone. The emperor thinking this hope well founded, and wishing to satisfy his curiosity, ordered his ambassador at the court of Constantinople to

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to aſk permiſſion to take up from the Danube one of the pillars of Trajan's bridge. The petition was granted, and one of the pillars was accordingly taken up; from which it appeared that the petrifaction had only advanced three fourths of an inch in the ſpace of 1500 years. There are, however, certain waters in which this tranſmutation is more readily accompliſhed.—Petrifactions appear to be formed more ſlowly in earths that are porous and in a ſlight degree moiſt than in water itſelf.

When the foundations of the city of Quebec in Canada were dug up, a petrified ſavage was found among the laſt beds to which they proceeded. Although there was no idea of the time at which this man had been buried under the ruins, it is however true, that his quiver and arrows were ſtill well preſerved. In digging a lead-mine in Derbyſhire, in 1744, a human ſkeleton was found among ſtags horns. It is impoſſible to ſay how many ages this carcaſe had lain there. In 1695 the entire ſkeleton of an elephant was dug up near Tonna in Thuringia. Some time before this epoch the petrified ſkeleton of a crocodile was found in the mines of that country. We might cite another fact equally curious which happened at the beginning of the laſt century. John Munte, curate of Slægarp in Scania, and ſeveral of his pariſhioners, wiſhing to procure turf from a drained marſhy ſoil, found, ſome feet below ground, an entire cart with the ſkeletons of the horſes and carter. It is preſumed that there had formerly been a lake in that place, and that the carter attempting to paſs over on the ice, had by that means probably periſhed. In fine, wood partly foſſil and partly coaly, has been found at a great depth, in the clay of which tile was made for the abbey of Fontenay. It is but very lately that foſſil wood was diſcovered at the depth of 75 feet in a well betwixt Iſſi and Vauvres near Paris. This wood was in ſand betwixt a bed of clay and pyrites, and water was found four feet lower than the pyrites. M. de Laumont, inſpector general of the mines, ſays (*Journal de Phyſique*, Mai 1736), that in the lead-mine at Pontpéan near Rennes, is a fiſſure, perhaps the only one of its kind. In that fiſſure, ſea-ſhells, rounded pebbles, and an entire beech, have been found 240 feet deep. This beech was laid horizontally in the direction of the fiſſure. Its bark was converted into pyrites, the ſap-wood into jet, and the centre into coal.

A great many pieces of petrified wood are found in different counties of France and Savoy. In Cobourg in Saxony, and in the mountains of Miſnia, trees of a conſiderable thickneſs have been taken from the earth, which were entirely changed into a very fine agate, as alſo their branches and their roots. In ſawing them, the annual circles of their growth have been diſtinguiſhed. Pieces have been taken up, on which it was diſtinctly ſeen that they had been gnawed by worms; others bear viſible marks of the hatchet. In fine, pieces have been found which were petrified at one end, while the other ſtill remained in the ſtate of wood fit for being burned. It appears then that petrified wood is a great deal leſs rare in nature than is commonly imagined.

Cronſtedt has excluded petrifactions from any place in the body of his ſyſtem of mineralogy, but takes notice of them in his appendix. He diſtinguiſhes them by the name of *Mineralia Larvata*, and defines them to be "mineral bodies in the form of animals or vegetables." The moſt remarkable obſervations concerning them, according to Mr Kirwan, who differs in ſome particulars from Mongez, are as follow. 1. Thoſe of ſhells are found on or near the ſurface of the earth; thoſe of fiſh deeper; and thoſe of wood deeper ſtill. Shells in ſubſtance are found in vaſt quantities, and at conſiderable depths. 2. The ſubſtances moſt ſuſceptible of petrifaction are thoſe which moſt reſiſt the putrefactive proceſs; of which kind are ſhells, the harder kinds of wood, &c.; while the ſofter parts of animals, which eaſily putrefy, are ſeldom met with in a petrified ſtate. 3. They are moſt commonly found in ſtrata of marl, chalk, limeſtone, or clay: ſeldom in ſandſtone, ſtill more ſeldom in gypſum; and never in gneiſs, granite, baſaltes, or ſchoerl. Sometimes they are found in pyrites, and ores of iron, copper, and ſilver; conſiſting almoſt always of that kind of earth or other mineral which ſurrounds them; ſometimes of ſilex, agate, or cornelian. 4. They are found in climates where the animals themſelves could not have exiſted. 5. Thoſe found in ſlate or clay are compreſſed and flattened.

The different ſpecies of petrifactions, according to Cronſtedt, are,

I. *Terræ Larvatæ;* extraneous bodies changed into a limy ſubſtance, or calcareous changes. Theſe are, 1. Looſe or friable. 2. Indurated. The former are of a chalky nature in form of vegetables or animals; the ſecond filled with ſolid limeſtone in the ſame forms. Some are found entirely changed into a calcareous ſpar. All of them are found in France, Sweden, and other countries in great plenty.

On theſe petrifactions Cronſtedt obſerves, that ſhells and corals are compoſed of limy matter even when ſtill inhabited by their animals, but they are claſſed among the petrifactions as ſoon as the calcareous particles have obtained a new arrangement; for example, when they have become ſparry; filled with calcareous earth either hardened or looſe, or when they lie in the ſtrata of the earth. "Theſe, ſays he, form the greateſt part of the foſſil collections which are ſo induſtriouſly made, often without any regard to the principal and only uſe they can be of, viz. that of enriching zoology. Mineralogiſts are ſatisfied with ſeeing the poſſibility of the changes the limeſtone undergoes in regard to its particles; and alſo with receiving ſome inſight into the alteration which the earth has been ſubject to from the ſtate of the ſtrata which are now found in it." The calcined ſhells, where the petrifactions are of a limy or chalky nature, anſwer extremely well as a manure; but the indurated kind ſerve only for making grottoes. Gypſeous petrifactions are extremely rare; however, Chardin informs us that he had ſeen a lizard incloſed in a ſtone of that kind in Perſia.

II. Larvæ, or bodies changed into a flinty ſubſtance. Theſe are all indurated, and are of the following ſpecies. 1. Cornelians in form of ſhells from the river Tomm in Siberia. 2. Agate in form of wood; a piece of which is ſaid to be in the collection of the Count de Teſſin. 3. Coralloids of white flint (*Millepora*) found in Sweden. 4. Wood of yellow flint found in Italy, in Turkey near Adrianople, and produced by the waters of Lough-neagh in Ireland.

III. *Larvæ Argillaceæ;* where the bodies appear to be

be changed into clay. These are found either loose and friable, or indurated. Of the former kind is a piece of porcelain clay met with in a certain collection, with all the marks of the root of a tree upon it. Of the latter kind is the osteocolla; which is said to be the roots of the poplar tree changed, and not to consist of any calcareous substance. A sort of fossil ivory, with all the properties of clay, is said likewise to be found in some places.

IV. *Larvæ insalitæ;* where the substances are impregnated with great quantities of salts. Human bodies have been twice found impregnated with vitriol of iron in the mine of Falun, in the province of Dalarne in Sweden. One of them was kept for several years in a glass case, but at last began to moulder and fall to pieces. Turf and roots of trees are likewise found in water strongly impregnated with vitriol. They do not flame, but look like a coal in a strong fire; neither do they decay in the air.

V. Bodies penetrated by mineral inflammable substances. 1. By pit-coal, such as wood; whence some have imagined coal to have been originally produced from wood. Some of these substances are fully saturated with the coaly matter; others not. Among the former Cronstedt reckons jet; among the latter the substance called *mumia vegetabilis*, which is of a loose texture, resembling amber, and may be used as such. 2. Those penetrated by asphaltum or rock-oil. The only example of these given by our author is a kind of turf in the province of Skone in Sweden. The Egyptian mummies, he observes, cannot have any place among this species, as they are impregnated artificially with asphaltum, in a manner similar to what happens naturally with the wood and coaly matter in the last species. 3. Those impregnated with sulphur which has dissolved iron, or with *pyrites*. Human bodies, bivalve and univalve shells and insects, have been all found in this state; and the last are found in the alum slate at Andrarum, in the province of Skone in Sweden.

VI. *Larvæ metalliferæ;* where the bodies are impregnated with metals. These are, 1. Covered with native silver; which is found on the surface of shells in England. 2. Where the metal is mineralized with copper and sulphur. Of this kind is the falhertz or gray silver ore, in the shape of ears of corn, and supposed to be vegetables, found in argillaceous slate at Frankenberg and Tahlitteren in Hesse. 3. *Larvæ cupriferæ*, where the bodies are impregnated with copper. To this species principally belong the turquoise or Turkey stones, improperly so called; being ivory and bones of the elephant or other animals impregnated with copper. At Simore in Languedoc there are bones of animals dug up, which, during calcination, assume a blue colour; but according to Cronstedt it is not probable that these owe their colour to copper. 3. With mineralized copper. Of these our author gives two examples. One is where the copper is mineralized with sulphur and iron, forming a yellow marcasitical ore. With this some shells are impregnated which lie upon a bed of loadstone in Norway. Other petrifactions of this kind are found in the form of fish in different parts of Germany. The other kind is where the copper is impregnated with sulphur and silver. Of this kind is the gray silver ore, like ears of corn, found in the slate quarries at Hesse. 4. *Larvæ ferriferæ*, with iron in form of a calx, which has assumed the place or shape of extraneous bodies. These are either loose or indurated. Of the loose kind are some roots of trees found at the lake Langelma in Finland. The indurated kinds are exemplified in some wood found at Orbissan in Bohemia. 5. Where the iron is mineralized, as in the pyritaceous larvæ, already described.

VII. Where the bodies are tending to decomposition, or in a way of destruction. Among these, our author enumerates MOULD and TURF. See likewise the article FOSSIL.

We shall add the following description of a very curious animal petrifaction. The Abbé de Sauvages, celebrated for his refined taste and knowledge in natural history, in a tour through Languedoc, between Alais and Uzes, met with a narrow vein of no more than two toises wide, which crosses the road, and is bordered on one side by a gray dirty soil, and on the other by a dry sandy earth, each of a vast extent, and on a level with the narrow vein which separates them. In this narrow vein only are contained petrified shells, cemented together by a whitish marl. They are in prodigious plenty; among which there is one species which the abbé does not remember to have known to have been anywhere described, and may probably be a new acquisition to natural history.

This shell has the shape of a horn, somewhat incurvated towards the base. It seems composed of several cups, let into each other, which are sometimes found separate. They have all deep channels, which extend, as in many other shells, from the base to the aperture; the projecting ribs which form these channels are mostly worn away, being rarely to be found entire. Sometimes several are grouped together; and as a proof that they are not a fortuitous assemblage caused by the petrifaction, they are fixed together through their whole length, in such sort, that their base and aperture are regularly turned the same way. The abbé should have referred this to the genus which Linnæus and the marquis d'Argenville named *dentalis*, had they not been let into each other. He found some of them whose aperture or hollow was not stopped up by the petrifaction, and seemed as cones adapted to one another, forming a row of narrow cells, separated by a very thin partition: this row occupied not more than one half of the cavity of the shell.

Our article has already extended to such a length as to preclude any further additions; we cannot, however, finish it without observing, that fossil bones are very common in Dalmatia. They are of various kinds, and in their nature apparently very extraordinary; but we have found no tolerable account or probable conjecture of their origin. Vitaliano Donati of Padua, in his *Saggio sopra la storie naturale dell' Adriatico*, was the first who took notice of them; and Fortis, in his Travels into Dalmatia, has given a copious account of them. They are most common in the islands of *Cherso* and *Osero*. See Fortis's Travels into Dalmatia; and those of our readers who wish to prosecute this inquiry may consult with advantage Parkinson's Organic Remains of a Former World, two vols. 4to.

PETRIFIED CITY. The story of a petrified city is well known all over Africa, and has been believed by many considerable persons even in Europe. Louis XIV. was so fully persuaded of its reality that he ordered

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dered his ambassador to procure the body of a man petrified from it at any price. Dr Shaw's account of this affair is as follows: "About 40 years ago (now more than 70), when M. le Maire was the French consul at Tripoli, he made great inquiries, by order of the French court, into the truth of the report concerning a petrified city at Ras Sem; and amongst other very curious accounts relating to this place, he told me a remarkable circumstance, to the great discredit, and even confutation, of all that had been so positively advanced with regard to the petrified bodies of men, children, and other animals.

"Some of the janizaries, who, in collecting tribute, traversed the district of Ras Sem, promised him, that, as an adult person would be too cumbersome, they would undertake, for a certain number of dollars, to bring him from thence the body of a little child. After a great many pretended difficulties, delays, and disappointments, they produced at length a little Cupid, which they had found, as he learned afterwards, among the ruins of Leptis; and, to conceal the deceit, they broke off the quiver, and some other of the distinguishing characteristics of that deity. However, he paid them for it, according to promise, 1000 dollars, which is about 150l. sterling of our money, as a reward for their faithful service and hazardous undertaking; having run the risk, as they pretended, of being strangled if they should have been discovered in thus delivering up to an infidel, one of those unfortunate Mahometans, as they take them originally to have been.

"But notwithstanding this cheat and imposition had made the consul desist from searching after the petrified bodies of men and other animals; yet there was one matter of fact, as he told me, which still very strangely embarrassed him, and even strongly engaged him in favour of the current report and tradition. This was some little loaves of bread, as he called them, which had been brought to him from that place. His reasoning, indeed thereupon, provided the pretended matter of fact had been clear and evident, was just and satisfactory; for where we find loaves of bread, there, as he urged, some persons must been employed in making them, as well as others for whom they were prepared. One of these loaves he had, among other petrifications, very fortunately brought with him to Cairo, where I saw it, and found it to be an echinites of the discoid kind, of the same fashion with one I had lately found and brought with me from the deserts of Marah. We may therefore reasonably conclude, that there is nothing to be found at Ras Sem, unless it be the trunks of trees, echinites, and such petrifications as have been discovered at other places.

"M. le Maire's inquiries, which we find were supported by the promise and performance of great rewards, have brought nothing further to light. He could never learn that any traces of walls, or buildings, or animals, or utensils, were ever to be seen within the verge of these pretended petrifications. The like account I had from a Sicilian renegado, who was the janizary that attended me whilst I was in Egypt; and as in his earlier years he had been a soldier of Tripoli, he assured me that he had been several times at Ras Sem. This I had confirmed again in my return from the Levant, by the interpreter of the British factory at Tunis, who was likewise a Sicilian renegado; and being the libertus or freedman of the bashaw of Tripoli, was preferred by him to be the bey or viceroy of the province of Darna, where Ras Sem was immediately under his jurisdiction. His account was likewise the same; neither had he ever seen, in his frequent journeys over this district, any other petrifications than what are above mentioned. So that the petrified city, with its walls, castles, streets, shops, cattle, inhabitants, and utensils, were all of them at first the mere inventions of the Arabs, and afterwards propagated by such persons, who, like the Tripoli ambassador, and his friend above mentioned, were credulous enough to believe them.

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"However, there is one remarkable circumstance relating to Ras Sem that deserves well to be recorded. When the winds have blown away the billows of sand, which frequently cover and conceal these petrifications, they discover, in some of the lower and more depressed places of this district, several little pools of water, which is usually of so ponderous a nature, that, upon drinking it, it passes through the body like quicksilver. This perhaps may be that petrifying fluid which has all along contributed to the conversion of the palm trees and the echini into stone: for the formation not only of these, but of petrifications of all kinds, may be entirely owing to their having first of all lodged in a bed of loam, clay, sand, or some other proper nidus or matrix, and afterwards gradually been acted upon and pervaded by such a petrifying fluid as we may suppose this to be."

To this account it may not be amiss to subjoin the memorial of Cassem Aga, the Tripoli ambassador at the court of Britain. The city, he says, is situated two days journey south from Onguela, and 17 days journey from Tripoli by caravan to the south-east. "As one of my friends (says the ambassador) desired me to give him in writing an account of what I knew touching the petrified city, I told him what I had heard from different persons, and particularly from the mouth of one man of credit who had been on the spot: that is to say, that it was a very spacious city, of a round form, having great and small streets therein, furnished with shops, with a vast castle magnificently built: that he had seen there several sorts of trees, the most part olives and palms, all of stone, and of a blue or rather lead colour: that he saw also figures of men in a posture of exercising their different employments; some holding in their hands stuffs, others bread, every one doing something, even women suckling their children, and in the embraces of their husbands, all of stone: that he went into the castle by three different gates, though there were many more, where he saw a man lying upon a bed of stone: that there were guards at the gates with pikes and javelins, in their hands: in short, that he saw in this wonderful city many sorts of animals, as camels, oxen, horses, asses, sheep, and birds, all of stone, and of the colour above mentioned.

We have subjoined this account, because it shows in striking colours the amazing credulity of mankind, and the avidity with which they swallow the marvellous, and the difficulty of discovering the truth respecting places or things at a distance from us.

PETROBRUSSIANS, a religious sect, which had its rise in France and the Netherlands about the year 1110. The name is derived from *Peter Bruys*, a Provençal, who made the most laudable attempt to reform the

Petrobrussians ‖ Petronius.

the abuses and remove the superstition that disgraced the beautiful simplicity of the gospel. His followers were numerous; and for 20 years his labour in the ministry was exemplary and unremitted. He was, however, burnt in the year 1130 by an enraged populace set on by the clergy.

The chief of Bruys's followers was a monk named *Henry*; from whom the Petrobrussians were also called *Henricians*. Peter the Venerable, abbot of Clugny, has an express treatise against the Petrobrussians; in the preface to which he reduces their opinions to five heads. 1. They denied that children before the age of reason can be justified by baptism, in regard it is our own faith that saves by baptism. 2. They held that no churches should be built, but that those that already are should be pulled down; an inn being as proper for prayers as a temple, and a stable as an altar. 3. That the cross ought to be pulled down and burnt, because we ought to abhor the instruments of our Saviour's passion. 4. That the real body and blood of Christ are not exhibited in the eucharist, but merely represented by their figures and symbols. 5. That sacrifices, alms, prayers, &c. do not avail the dead. F. Langlois objects Manicheism to the Petrobrussians; and says, they maintained two gods, the one good, the other evil: but this we rather esteem an effect of his zeal for the catholic cause, which determined him to blacken the adversaries thereof, than any real sentiment of the Petrobrussians.

PETROJOANNITES, were followers of Peter John, or Peter Joannis, *i. e.* Peter the son of John, who flourished in the 12th century. His doctrine was not known till after his death, when his body was taken out of his grave and burnt. His opinions were, that he alone had the knowledge of the true sense wherein the apostles preached the gospel; that the reasonable soul is not the form of man; that there is no grace infused by baptism; and that Jesus Christ was pierced with a lance on the cross before he expired.

PETROLEUM, or Rock Oil; a thick oily substance exuding from the earth, and collected on the surface of wells in many parts of the world. See Mineralogy *Index*.

PETROMYZON, the Lamprey, a genus of fishes belonging to the order *Cartilaginei*. See Ichthyology *Index*.

PETRONIUS was a renowned Roman senator. When governor of Egypt, he permitted Herod, king of the Jews, to purchase in Alexandria any quantity of corn which he should judge necessary for the supply of his subjects, who were afflicted with a severe famine. When Tiberius died, Caius Caligula, who succeeded him, took from Vitellius the government of Syria, and gave it to Petronius, who discharged the duties of his office with dignity and honour. From his inclination to favour the Jews, he run the risk of losing the emperor's friendship and his own life; for when that prince gave orders to have his statue deposited in the temple of Jerusalem, Petronius, finding that the Jews would rather suffer death than see that sacred place profaned, was unwilling to have recourse to violent measures; and therefore preferred a moderation, dictated by humanity, to a cruel obedience. We must not confound him with another of the same name, viz. Petronius Granius, who was a centurion in the eighth legion, and served under Cæsar in the Gallic war. In his voyage to Africa, of which country he had been appointed quæstor, the ship in which he sailed was taken by Scipio, who caused all the soldiers to be put to the sword, and promised to save the quæstor's life, provided that he would renounce Cæsar's party. To this proposal Petronius replied, that "Cæsar's officers were accustomed to grant life to others, and not to receive it;" and, at the same time, he stabbed himself with his own sword.

Petronius.

PETRONIUS *Arbiter*, *Titus*, a celebrated critic and polite writer of antiquity, the favourite of Nero, supposed to be the same mentioned by Tacitus in the 16th book of his Annals. He was proconsul of Bithynia, and afterwards consul, and appeared capable of the greatest employments. He was one of Nero's principal confidants, and in a manner the superintendant of his pleasures; for that prince thought nothing agreeable or delightful but what was approved by Petronius. The great favours shown him drew upon him the envy of Tigellinus, another of Nero's favourites, who accused him of being concerned in a conspiracy against the emperor; on which Petronius was seized, and was sentenced to die. He met death with a striking indifference, and seems to have tasted it nearly as he had done his pleasures. He would sometimes open a vein, and sometimes close it, conversing with his friends in the meanwhile, not on the immortality of the soul, which was no part of his creed, but on topics which pleased his fancy, as of love-verses, agreeable and passionate airs; so that it has been said "his dying was barely ceasing to live." Of this disciple of Epicurus, Tacitus gives the following character: "He was (says he) neither a spendthrift nor a debauchee, like the generality of those who ruin themselves; but a refined voluptuary, who devoted the day to sleep, and the night to the duties of his office, and to pleasure." This courtier is much distinguished by a satire which he wrote, and secretly conveyed to Nero; in which he ingeniously describes, under borrowed names, the character of this prince. Voltaire is of opinion that we have no more of this performance but an extract made by some obscure libertine, without either taste or judgment. Peter Petit discovered at Traw in Dalmatia, in 1665, a considerable fragment containing the sequel of Trimalcion's Feast. This fragment, which was printed the year after at Padua and at Paris, produced a paper war among the learned. While some affirmed that it was the work of Petronius, and others denied it to be so, Petit continued to assert his right to the discovery of the manuscript, and sent it to Rome, where it was acknowledged to be a production of the 15th century. The French critics, who had attacked its authenticity, were silent from the moment it was deposited in the royal library. It is now generally attributed to Petronius, and found in every subsequent edition of the works of that refined voluptuary. The public did not form the same favourable opinion of some other fragments, which were extracted from a manuscript found at Belgrade in 1688, and printed at Paris by Nodot in 1694, though they are ascribed by the editor Charpentier, and several other learned men, to Petronius; yet, on account of the Gallicisms, and other barbarous expressions with which they abound, they have generally been considered as unworthy of that author. His genuine works are, 1. A Poem on the civil war between Cæsar and Pompey, translated into prose by Abbé de Marolles, and into French verse by President Bouhier, 1737, in 4to. Petronius,

Petronius ‖ Petteia.

tronius, full of fire and enthusiasm, and disgusted with Lucan's flowery language, opposed Pharsalia to Pharsalia; but his work, though evidently superior to the other in some respects, is by no means in the true style of epic poetry. 2. A Poem on the Education of the Roman Youth. 3. Two Treatises; one upon the Corruption of Eloquence, and the other on the Causes of the Decay of Arts and Sciences. 4. A Poem on the Vanity of Dreams. 5. The Shipwreck of Licas. 6. Reflections on the Inconstancy of Human Life. And, 7. Trimalcion's Banquet. To this last performance morality is not much indebted. It is a description of the pleasures of a corrupted court; and the painter is rather an ingenious courtier than a person whose aim is to perform abuses. The best editions of Petronius are those published at Venice, 1499, in 4to; at Amsterdam, 1669, in 8vo, *cum notis variorum*; Ibid. with Boschius's notes, 1677, in 24to; and 1700, two vols. in 24to. The edition of *variorum* was reprinted in 1743, in two vols. 4to, with the learned Peter Burman's commentaries. Petronius died in the year 65 or 66.

PETRONIUS *Maximus*, was born in the year 395, of an illustrious family, being at first a senator and consul of Rome. He put on the imperial purple in 455, after having effected the assassination of Valentinian III. In order to establish himself upon the throne, he married Eudoxia the widow of that unfortunate prince; and as she was ignorant of his villany, he confessed to her, in a transport of love, that the strong desire he had of being her husband, had made him commit this atrocious crime. Whereupon Eudoxia privately applied to Genseric, king of the Vandals, who coming into Italy with a very powerful army, entered Rome, where the usurper then was. The unhappy wretch endeavoured to make his escape; but the soldiers and people, enraged at his cowardice, fell upon him, and overwhelmed him with a shower of stones. His body was dragged through the streets of the city for three days; and, after treating it with every mark of disgrace, they threw it into the Tiber the 12th of June the same year, 455. He reigned only 77 days. He had some good qualities. He loved and cultivated the sciences. He was prudent in his councils, circumspect in his actions, equitable in his judgments; a facetious companion, and steady friend. He had the good fortune to win the affections of every body, while he remained a private character; but as a prince, he was so much the more detestable, in that, after he had obtained the throne by villany, he kept possession of it only by violence. The crown was scarcely on his head before it appeared to him an insupportable burden. "Happy Democles (exclaimed he in his despair), thou wert a king during a single entertainment."

PETROSA OSSA, in *Anatomy*, a name given to the fourth and fifth bones of the cranium, called also *ossa temporum* and *ossa squamosa*; the substance whereof, as their first and last names express, is squamose and very hard. See ANATOMY *Index*.

PETROSELINUM (APIUM PETROSELINUM, Lin.) *Parsley*, a plant which is commonly cultivated for culinary purposes. See BOTANY and GARDENING *Index*.

PETTEIA, in the ancient music, a term to which we have no one corresponding in our language.

The melopœia, or the art of arranging sounds in succession so as to make melody, is divided into three parts, which the Greeks call *lepsis*, *mixis*, and *chresis*; the Latins *sumptio*, *mixio*, and *usus*; and the Italians *presa*, *mescolamento*, and *uso*. The last of these is called by the Greeks πεττεια, and by the Italians *pettia*; which therefore means the art of making a just discernment of all the manners of ranging or combining sounds among themselves, so as they may produce their effect, i. e. may express the several passions intended to be raised. Thus it shows what sounds are to be used, and what not; how often they are severally to be repeated; with which to begin, and with which to end; whether with a grave sound to rise, or an acute one to fall, &c. The petteia constitutes the manners of the music; chooses out this or that passion, this or that motion of the soul, to be awakened; and determines whether it be proper to excite it on this or that occasion. The petteia, therefore, is in music much what the manners are in poetry.

Petteia, Petty.

It is not easy to discover whence the denomination should have been taken by the Greeks, unless from πεττεια, their game of chess, the musical petteia being a sort of combination and arrangement of sounds, as chess is of pieces called πεττοι, *calculi*, or "chess-men."

PETTY, SIR WILLIAM, son of Anthony Petty, a clothier, was born at Rumsey, a small town in Hampshire, in 1623; and while a boy took great delight in spending his time among the artificers, whose trades he could work at when but twelve years of age. Then he went to the grammar school there: at fifteen he was master of the Latin, Greek, and French tongues, and of arithmetic and those parts of practical geometry and astronomy useful to navigation. Soon after he went to Caen in Normandy, and Paris, where he studied anatomy, and read Vesalius with Mr Hobbes. Upon his return to England, he was preferred in the king's navy. In 1643, when the war between the king and parliament grew hot, he went into the Netherlands and France for three years; and having vigorously prosecuted his studies, especially in physic, at Utrecht, Leyden, Amsterdam, and Paris, he returned home to Rumsey. In 1647, he obtained a patent to teach the art of double writing for seventeen years. In 1648, he published at London "Advice to Mr Samuel Hartlib, for the advancement of some particular parts of learning." At this time he adhered to the prevailing party of the kingdom; and went to Oxford, where he taught anatomy and chemistry, and was created a doctor of physic. In 1650, he was made professor of anatomy there; and soon after a member of the college of physicians in London. The same year he became physician to the army in Ireland; where he continued till 1659, and acquired a great fortune. After the restoration, he was introduced to King Charles II. who knighted him in 1661. In 1662, he published "A Treatise of taxes and contributions." Next year he was greatly applauded in Ireland for his invention of a double-bottomed ship. He died at London, in 1687, of a gangrene in the foot, occasioned by the swelling of the gout.

The character of his genius is sufficiently seen in his writings, which were much more numerous than those we have mentioned above. Among these, it is said, he wrote the history of his own life, which unquestionably contained a full account of his political and religious principles, as may be conjectured from what he has left us upon these subjects in his will. In that he has these remarkable words: "As for legacies to the poor, I am at a stand; and for beggars by trade and election, I give them

Petty. || Petworth.

them nothing: as for impotents by the hand of God, the public ought to maintain them: as for those who can get no work, the magistrates should cause them to be employed; which may be well done in Ireland, where are fifteen acres of improveable land for every head: as for prisoners for crimes by the king, or for debt by their prosecutors, those who compassionate the sufferings of any object, let them relieve themselves by relieving such sufferers; that is, give them alms (A), &c. I am contented that I have assisted all my poor relations, and put many into a way of getting their own bread, and have laboured in public works and inventions, and have sought out real objects of charity; and do hereby conjure all who partake of my estate, from time to time to do the same at their peril. Nevertheless, to answer custom, and to take the sure side, I give twenty pounds to the most wanting of the parish wherein I die." As for his religion, he says, "I die in the profession of that faith, and in the practice of such worship, as I find established by the laws of my country; not being able to believe what I myself please, nor to worship God better than by doing as I would be done unto, and observing the laws of my country, and expressing my love and honour to Almighty God, by such signs and tokens as are understood to be such by the people with whom I live." He died possessed of a very large fortune, and his family was afterwards ennobled.

The variety of pursuits in which Sir William Petty was engaged, shows him to have had a genius capable of any thing to which he chose to apply it; and it is very extraordinary, that a man of so active and busy a spirit could find time to write so many things as it appears he did.

Petty, any thing little or diminutive, when compared with another.

Petty-Bag, an office in chancery; the three clerks of which record the return of all inquisitions out of every county, and make all patents of comptrollers, gaugers, customers, &c.

Petty-Chaps. See Motacilla, Ornithology *Index*.

Petty-Fogger, a little tricking solicitor or attorney, without either skill or conscience.

Petty, or *Petit, Larceny*. See Larceny.

Petty-Patees, among confectioners, a sort of small pies, made of a rich crust filled with sweetmeats.

Petty-Singles, among falconers, are the toes of a hawk.

Petty Tally, in the sea language, a competent allowance of victuals, according to the number of the ship's company.

Petty, or *Petit, Treason*. See Treason.

PETUNSE, in *Natural History*, one of the two substances of which porcelain or china-ware is made. The petunse is a coarse kind of flint or pebble, the surface of which is not so smooth when broken as that of our common flint. See Porcelain.

PETWORTH, in Sussex in England, five miles from Midhurst and the Sussex Downs, and 49 from London, is a large and handsome town, with 2664 inhabitants. It is adorned with several seats of gentlemen, particularly the magnificent seat of the Percies, earls of Northumberland, many of whom lie buried in a separate vault of its church. In the duke of Somerset's armory, in this place, there is a sword which, by circumstances, appears to have been the weapon of the famous Henry Hotspur, though it is less unwieldy than other ancient swords.

Petworth || Peyrere.

PEUCEDANUM, or Sulphur-wort, a genus of plants belonging to the pentandria class, and in the natural method ranking under the 45th order, *Umbellatæ*. See Botany *Index*.

PEUTEMAN, Peter, was born at Rotterdam in 1650, and was a good painter of inanimate objects; but the most memorable particular relative to this artist was the incident which occasioned his death.

He was requested to paint an emblematical picture of mortality, representing human skulls and bones, surrounded with rich gems and musical instruments, to express the vanity of this world's pleasures, amusements, or possessions; and that he might imitate nature with the greater exactness, he went into an anatomy room, where several skeletons hung by wires from the ceiling, and bones, skulls, &c. lay scattered about; and immediately prepared to make his designs. *Dict. of Painters.*

While he was thus employed, either by fatigue, or by intense study, insensibly he fell asleep; but was suddenly roused by a shock of an earthquake, which happened at that instant, on the 18th of September 1692. The moment he awoke, he observed the skeletons move about as they were shaken in different directions, and the loose skulls roll from one side of the room to the other; and being totally ignorant of the cause, he was struck with such a horror, that he threw himself down stairs, and tumbled into the street half dead. His friends took all possible pains to efface the impression made on his mind by that unlucky event, and acquainted him with the real cause of the agitation of the skeletons; yet the transaction still affected his spirits in so violent a manner, that it brought on a disorder, which in a short time ended his days. His general subjects were either allegorical or emblematical allusions to the shortness and misery of human life.

PEWIT, Sea-crow, or *Mire-Crow*. See Larus, Ornithology *Index*.

PEWTER, a fictitious metal used in making domestic utensils, as plates, dishes, &c.—The basis of the metal is tin, united to small portions of lead, zinc, bismuth, and antimony. "We have (says Dr Watson) three sorts of pewter in common use; they are distinguished by the name of *Plate*, *Trifle*, and *Ley*. The plate pewter is used for plates and dishes; the trifle, chiefly for pints and quarts; and the ley-metal for wine measures, &c. Our very best pewter is said to consist of 100 parts tin, and 17 of antimony, though others allow only 10 parts of the latter *." Besides this composition, there are other kinds, compounded of tin, antimony, bismuth, and copper, in several proportions. * *Chem. Essays*, iv. 167.

PEYRERE, Isaac la, a remarkable character for versatility in religious opinions, was born at Bourdeaux, of Protestant parents, in 1594. He entered the service of

(A) In the town of Rumsey there is a house which was given by him for the maintenance of a charity-school: the rent of which is still applied to that use.

Peyrere. of the Prince of Conde, who was much pleased with the singularity of his genius. From the perusal of St Paul's writings he took into his head to aver, that Adam was not the first of the human race; and, in order to prove this extravagant opinion, he published in 1655 a book, which was printed in Holland in 4to and in 12mo, with this title: *Præadamitæ, sive exercitatio super versibus 12, 13, 14. cap. 15. Epistolæ Pauli ad Romanos.* This work was burnt at Paris, and the author imprisoned at Brussels, through the influence of the archbishop of Malines's grand vicar. The Prince of Conde having obtained his liberty, he travelled to Rome in 1656, and there gave in to Pope Alexander VII. a solemn renunciation both of Calvinism and Preadamism. His conversion was not thought to be sincere, at least with regard to this last heresy. His desire to be the head of a new sect is evident; and his book discovers his ambition; for he there pays many compliments to the Jews, and invites them to attend his lectures. Upon his return to Paris, notwithstanding the earnest solicitations of his holiness to remain at Rome, he went again into the Prince of Conde's service in the quality of librarian. Some time after he retired to the seminary *des Vertus*, where he died the 30th of January 1676, at the age of 82, after the sacraments of the church had been administered to him. Father Simon says, that when he was importuned in his last moments to retract the opinion which he had formed respecting the Preadamites, his answer was, *Hi quæcunque ignorant blasphemant.* His having no fixed sentiments of religion is supposed to proceed more from a peculiar turn of mind than a corruption of the heart; for good nature, simplicity of manners, and humanity, seem to have formed his character. "He was (says Niceron) a man of a very equal temper, and most agreeable conversation. He was a little too fond, however, of indulging his wit, which sometimes bordered on raillery; but he took care never to hurt nor wound the feelings of his neighbour. His learning was extremely limited. He knew nothing either of Greek or Hebrew; and yet he ventured to give a new interpretation of several passages of the sacred volume. He piqued himself on his knowledge of the Latin; but excepting a few poets which he had read, he was by no means an adept in that language. His style is very unequal; sometimes swelling and pompous, at other times low and grovelling." Besides the work already mentioned, he has left behind him, I. A treatise as singular as it is scarce, intitled, *Du rappel de Juifs*, 1643, in 8vo. The recal of the Israelites, in the opinion of this writer, will be not only of a spiritual nature, but they will be reinstated in the temporal blessings which they enjoyed before their rejection. They will again take possession of the holy land, which will resume its former fertility. God will then raise up to them a king more just, and more victorious, than any of their former sovereigns had been. Now, though all this is doubtless to be understood spiritually of Jesus Christ, yet our author is of opinion, that it ought also to be understood of a temporal prince, who shall arise for the purpose of effecting the temporal deliverance of the Jews; and that this prince shall be no other than the king of France, for the following reasons, which, it is believed, will carry conviction to few minds: 1. Because the two titles of *Most Christian*, and of *Eldest Son of the Church*, are ascribed to him by way of excellence. 2. Because it is presumable, if the kings of France possess the virtue of curing the evil or scrofula, which can only afflict the bodies of the Jews; that they will likewise have the power of curing their obstinate incredulity, and the other inveterate diseases of their souls. 3. Because the kings of France have for their arms a *fleur de luce*; and because the beauty of the church is in scripture compared to the beauty of lilies. 4. Because it is probable that France will be the country whither the Jews shall first be invited to come and embrace the Christian faith, and whither they shall retreat from the persecution of the nations that have dominion over them; for France is a land of freedom, it admits of no slavery, and whoever touches it is free. Peyrere, after explaining his strange system, proposes a method of converting the Jews to Christianity; a method, says Niceron, which will not be acceptable to many. He proposes to reduce the whole of religion to a bare faith or belief in Jesus Christ; taking it for granted, without any shadow of proof, that "it is as difficult to comprehend the articles of our faith, as to observe the ceremonies of Moses.—From this scheme (says he) there would result a double advantage to the church; the reunion of the Jews, and of all those Christians who are separated from the body of the church." Peyrere, when he wrote this book, was a Calvinist; but his Calvinism too nearly resembled the Deism of our age. He confessed himself, that his reason for quitting the Protestants was on account of their being the first and principal opposers of his book concerning the Preadamites. II. A curious and entertaining account of Greenland, printed in 8vo, 1647. When he was asked, on occasion of this work, why there were so many witches in the north? he replied, "It is because part of the property of these pretended conjurers, when condemned to suffer death, is declared to belong to their judges." III. An equally interesting account of Iceland, 1663, 8vo. IV. A letter to Philotimus, 1658, in 8vo, in which he explains the reasons of his recantation, &c. We find in Moreri the following epitaph of him, written by a poet of his own times.

> La Peyrere ici gît, ce bon Israelite,
> Huguenot, Catholique, enfin Preadamite:
> Quatre religions lui plurent à la fois,
> Et son indifference etoit si peu commune,
> Qu'après quatre-vingts ans qu'il eut à faire un
> choix,
> Le bon homme partit, & n'en choisit pas une.

Peyronius. PEYRONIUS, Francis de la, for a long time practised surgery at Paris with such distinguished eclat, that he obtained for himself the appointment of first surgeon to Louis XV. He improved this favourable situation with his majesty, and procured to his profession those honours which had the effect to quicken its progress, and those establishments which contributed to extend its benefits. The Royal College of Surgery at Paris was founded by his means in 1731, was enlightened by his knowledge, and encouraged by his munificence. At his death, which happened at Versailles the 24th of April 1747, he bequeathed to the society of surgeons in Paris two thirds of his effects, his estate of Marigni, which was sold to the king for 200,000 livres, and his library. This useful citizen also left to the society of surgeons at Montpelier two houses, situated in that

Peyronius, Peyroufe. that town, with 100,000 livres, for the purpofe of erecting there a chirurgical amphitheatre. He appointed the fame fociety univerfal legatee for the third of his effects; and all thefe legacies contain claufes whofe fole object is to promote the public good, the perfection and improvement of furgery; for which he always folicited the protection of the court. At the time of the famous difpute between the phyficians and furgeons, he entreated the Chancellor d'Agueffau to build up a brazen wall between the two bodies. "I will do fo, replied the minifter, but on what fide of the wall fhall we place the fick:" Peyronius afterwards behaved with more moderation.—He was a philofopher without any oftentation; but his philofophy was tempered by a long acquaintance with the world and with the court. The acutenefs and delicacy of his underftanding, joined to his natural vivacity, rendered his converfation agreeable; and all thefe advantages were crowned with a quality ftill more valuable, an uncommon degree of fympathy for thofe in diftrefs. He was no fooner known to be at his eftate in the country, than his houfe was filled with fick people, who came to him from the diftance of 7 or 8 leagues round about. He had once a plan of eftablifhing, on this fpot, an hofpital, to which he intended to retire, that he might devote the remainder of his life to the fervice of the poor.

PEYROUSE, or PEROUSE, JOHN FRANCIS GALOUP DE LA, the celebrated but unfortunate French navigator, was born at Albi in the year 1741. His father intended to train him up to a maritime life, for which purpofe he fent him, when very young, to the marine fchool, where he became enthufiaftically attached to his profeffion, and ambitious to emulate the fame of the moft celebrated navigators.

He was appointed midfhipman on the 19th of November 1756, behaving with great bravery in that ftation; and was feverely wounded in the engagement between Hawke and Conflans, on the 20th of November 1759. The Formidable, in which he ferved, was taken, after a vigorous refiftance; and it is probable that Peyroufe reaped fome advantage from his acquaintance with Britifh officers.

He was promoted, on the 1ft of October 1764, to the rank of lieutenant; and as he abhorred a life of eafe and idlenefs, he contrived to be employed in fix different fhips of war during the peace that fubfifted between Great Britain and France. In 1767 he was promoted to the rank of mafter and commander. In 1779 he commanded the Amazone, belonging to the fquadron of Vice-admiral Count d'Eftaing; and when that officer engaged Admiral Byron, the poft of La Peyroufe was to carry the orders of the admiral to the whole of the line. He afterwards took the floop Ariel, and contributed to the capture of the Experiment.

In the year 1782, La Peyroufe was fent with the Sceptre of 74 guns, and two frigates of 36 guns each, with fome troops and field-pieces on board, to deftroy the Englifh fettlements in Hudfon's Bay, which was eafily accomplifhed, as nothing was found on fhore to oppofe the fmalleft force. Having deftroyed the fettlements, he learned that fome of the Englifh had fled at his approach into the woods. He generoufly left them provifions and arms to defend themfelves againft the favages.

In the year 1785, he was appointed to the command of fome fhips employed in a voyage round the world, which unfortunately proved his laft. Of this voyage, as far as it was accomplifhed, full accounts have been already publifhed, from which it is manifeft that Peyroufe was admirably qualified to difcharge fuch a truft. He was an experienced and fkilful feaman; a man of mathematical and phyfical fcience, uncorrupted by that falfe philofophy which difgraced many of his attendants, and capable of the utmoft perfeverance in every commendable purfuit. To thefe excellent qualities he added caution and courage, with a difpofition truly benevolent towards the favages whom he vifited. Moft of the calamities attendant on the voyage, with the exception of the laft, were occafioned by the difobedience of his officers, or their neglecting to follow his advice. Peyroufe ‖ Pezisa.

The laft difpatches of this great and truly excellent man were dated from Botany Bay, February 7. 1788; and fince that period, no account of him has been received which is entitled to the fmalleft credit.

PEZAY, N. MASSON, MARQUIS OF, born at Paris, very early applied himfelf to the ftudy of letters, and afterwards went into the army. He was made a captain of dragoons; and had the honour of giving fome leffons on tactics to the ill-fated Louis XVI. Being appointed infpector general of fome coafting veffels, he repaired to the maritime towns, and executed his commiffion with more care and attention than was to have been expected from a votary of the mufes. But as, at the fame time, he fhowed too much haughtinefs, a complaint was brought againft him to the court, and he was banifhed to his country feat, where he died foon after, in the beginning of 1778. He was the intimate friend and companion of Dorat. He had ftudied, and fuccefsfully imitated, his manner of writing; but his poems have more delicacy, and are lefs disfigured with trifling converfations of gallantry. He has left behind him, 1. A tranflation of Catullus, which is not much efteemed. 2. Les Soirées Helvetiennes, Alfaciennes, et Franc-Comtoifes, in 8vo, 1770; a work very agreeably diverfified, full of charming landfcapes, but written with too little accuracy. 3. Les Soirées Provençales, in manufcript, which are faid to be nowife inferior in merit to the foregoing ones. 4. La Rofiere de Salency; a paftoral in three acts, and which has been performed with fuccefs on the Italian theatres. 5. Les campagnes de Maillebois, in 3 vols 4to, and a volume of maps.

PEZENAS, a place in France about 24 miles from Montpelier. The foil about it is fandy. The rock is limeftone. The fields are open, and produce corn, wine, and oil. There are to be feen at this place the extenfive ruins of a caftle, which formerly belonged to the Montmorency family. This ftrong fortrefs was hewn out of the rock on which it ftands, and appears to have been complicated and full of art. The walls are lofty, and above 8 feet in thicknefs. The rock, which is perpendicular, is a mafs of fhells, fuch as turbinites, oyfters, cockles, with a calcareous cement. From hence the circumjacent plain, decked with luxuriant verdure, and fhut in by rugged mountains, affords a moft delightful profpect. E. Long. 3. 35. N. Lat. 43. 18.

PEZIZA, CUP-MUSHROOM, a genus of plants of the natural order of fungi, belonging to the cryptogamia clafs. See BOTANY *Index*.

PHACA,

PHACA, a genus of plants belonging to the diadelphia class; and in the natural method ranking under the 22d order, *Papilionaceæ*. See BOTANY *Index*.

PHÆA, in *Antiquity*, a famous sow which infested the neighbourhood of Cromyon. Theseus destroyed it as he was travelling from Trœzene to Athens to make himself known to his father. Some imagine that the boar of Calydon sprang from this sow. According to some authors, Phæa was a woman who prostituted herself to strangers, whom she murdered, and afterwards plundered.

PHÆACIA, one of the ancient names of the island Corcyra. *Phæaces* the people, who were noted for their indolence and luxury.

PHÆDON, a disciple of Socrates, who had been seized by pirates in his youth; and the philosopher, who seemed to discover something uncommon in his countenance, bought his liberty for a sum of money. Phædon, after Socrates's death, returned to Elis his native country, where he founded a sect of philosophers who composed what was called the *Eliac school*. The name of Phædon is affixed to one of Plato's dialogues.

PHÆDRA, in fabulous history, was a daughter of Minos and Pasiphae; she married Theseus, by whom she was the mother of Acamas and Demophoon. They had already lived for some time in conjugal felicity, when Venus, who hated all the descendants of Apollo, because he had discovered her amours with Mars, inspired Phædra with the strongest passion for Hippolytus the son of Theseus, by the amazon Hippolyte. This passion she long attempted to stifle, but in vain; and therefore, in the absence of Theseus, she addressed Hippolytus with all the impatience of desponding love. He rejected her with horror and disdain. She, however, incensed by the reception she had met, resolved to punish his coldness and refusal; and at the return of Theseus she accused Hippolytus of attempts upon her virtue. He listened to her accusation; and without hearing Hippolytus's defence, he banished him from his kingdom, and implored Neptune, who had promised to grant three of his requests, to punish him in an exemplary manner. As Hippolytus fled from Athens, his horses were suddenly terrified by a sea monster, which Neptune had sent on the shore; and he was thus dragged through precipices and over rocks, trampled under the feet of his horses, and crushed under the wheels of his chariot. When his tragical end was known at Athens, Phædra confessed her crime, and hung herself in despair, unable to survive one whose death her extreme guilt had occasioned. The death of Hippolytus, and the infamous passion of Phædra, is the subject of one of the tragedies of Euripides and of Seneca. She was buried at Trœzene, where her tomb was still to be seen in the time of the geographer Pausanias, near the temple of Venus, which she had built to render the goddess favourable to her incestuous passion. Near her tomb was a myrtle, whose leaves were full of small holes, which, it was reported, Phædra had done with a hair pin, when the vehemence of her passion had rendered her melancholy and almost desperate. She was represented in a painting in Apollo's temple at Delphi, as suspended in the air, while her sister Ariadne stood near to her, and fixed her eyes upon her.

PHÆDRUS, an ancient Latin writer, who composed five books of fables, in iambic verse. He was a Thracian; and was born, as there is reason to conclude, some years before Julius Cæsar made himself master of the Roman empire. How he came into the service of Augustus is not known: but his being called *Augustus's freedman* in the title of the book, shows that he had been that emperor's slave. The fables of Phædrus are valued for their wit and good sense, expressed in very pure and elegant language; and it is remarkable that they remained buried in libraries altogether unknown to the public, until they were discovered and published by Peter Pithou, or Pithœus, a learned French gentleman, toward the close of the 16th century.

PHÆNOMENON, in philosophy, denotes any remarkable appearance, whether in the heavens or earth, and whether discovered by observation or experiment.

PHAETON, in fabulous history, was the son of the Sun, or Phœbus and Clymene, one of the Oceanides. He was son of Cephalus and Aurora, according to Hesiod and Pausanias; or of Tithonus and Aurora, according to Apollodorus. He is, however, more generally acknowledged to be the son of Phœbus and Clymene. He was naturally of a lively disposition, and a handsome figure. Venus became enamoured of him, and entrusted him with the care of one of her temples. This distinguishing favour of the goddess rendered him vain and aspiring; and when Epaphus, the son of Io, had told him, to check his pride, that he was not the son of Phœbus, Phaeton resolved to know his true origin, and at the instigation of his mother he visited the palace of the sun. He begged Phœbus, that if he really were his father, he would give him incontestable proofs of his paternal tenderness, and convince the world of his legitimacy. Phœbus received him with great tenderness, and swore by Styx to grant whatever he requested as a proof of his acknowledging him for his son. The youth boldly asked the direction of the chariot of the sun for one day. His father, grieved and surprised at this demand, used all his arguments to dissuade him from the rash attempt; but all was in vain: and being by his oath reduced to submit to his obstinacy, entrusted him with the reins, after he had directed him how to use them. The young adventurer was however soon sensible of his madness. He was unable to guide the fiery steeds; and loosing the reins, Jupiter, to prevent his consuming the heavens and earth, struck him with a thunderbolt, and hurled him from his seat into the river Eridanus or Po. His sisters Phaëthusa, Lambetia, and Phœbe, lamenting his loss upon its banks, were changed by the gods into black poplar trees; and Cycnus king of Liguria, also grieving at his fate, was transformed into a swan.

The poets say, that while Phaeton was driving the chariot of his father, the blood of the Ethiopians was dried up; and their skin became black; a colour which is still preserved among the greatest part of the inhabitants of the torrid zone. The territories of Libya were also, they tell us, parched up, on account of their too great vicinity to the sun; and ever since, Africa, unable to recover her original verdure and fruitfulness, has exhibited a sandy country and uncultivated waste. According to those who explain this poetical fable, Phaeton was a Ligurian prince, who studied astronomy, and in whose age the neighbourhood of the Po was visited with uncommon heats.

PHAETON, a genus of birds belonging to the order of anferes. See ORNITHOLOGY *Index*.

PHAGEDÆNA, in *Medicine*, denotes a corroding ulcer.

PHAGEDENIC MEDICINES, thofe ufed to eat off proud or fungous flefh; fuch as are all the cauftics.

PHAGEDENIC *Water*, in *Chemiftry*, denotes a water made from quicklime and fublimate; and is very efficacious in the cure of phagedenic ulcers. To prepare this water, put two pounds of frefh quicklime in a large earthen pan, and pour upon it about ten pounds of rain-water; let them ftand together for two days, ftirring them frequently: at laft leave the lime to fettle well, then pour off the water by inclination, filtrate it, and put it up in a glafs bottle, adding to it an ounce of corrofive fublimate in powder; which from white becomes yellow, and finks to the bottom of the veffel. The water being fettled, is fit for ufe in the cleanfing of wounds and ulcers, and to eat off fuperfluous flefh, and efpecially in gangrenes; in which cafe may be added to it a third or fourth part of fpirit of wine.

PHALÆNA, the MOTH, a genus of infects belonging to the order of lepidoptera. See ENTOMOLOGY *Index*.

PHALANGIUM, a genus of infects belonging to the order of aptera. See ENTOMOLOGY *Index*.

PHALANGOSIS, in *Surgery*, is a tumor and relaxation of the eyelids, often fo great as to deform the eye, and confiderably to impede vifion. Sometimes the eyelid when in this ftate fubfides or finks down, occafioned perhaps either by a palfy of the mufcle which fuftains and elevates the eyelid, or elfe from a relaxation of the cutis above, from various caufes. But in the paralytic or relaxed cafe, the ufe of cordial and nervous medicines muft be propofed internally; and outwardly, balfam of Peru and Hungary water are to be employed. If all thefe fail, the remaining method of cure is to extirpate a fufficient quantity of the relaxed cutis.

PHALANX, in Grecian antiquity, a fquare battalion of foldiers, with their fhields joined and pikes croffing each other; fo that it was next to impoffible to break it.

The Macedonian phalanx is fuppofed by fome to have had the advantage in valour and ftrength, over the Roman legion. Its number was 8000 men. But the word *phalanx* is ufed for a party of 28, and feveral other numbers; and even fometimes for the whole body of foot. See LEGION.

PHALANX is applied, by anatomifts, to the three rows of fmall bones which form the fingers. See ANATOMY *Index*.

PHALARIS, a remarkable tyrant, born at Crete, where his ambitious defigns occafioned his banifhment: he took refuge in Agrigentum, a free city of Sicily, and there obtained the fupreme power by ftratagem. The circumftance which has chiefly contributed to preferve his name in hiftory is his cruelty; in one act of which he gave, however, an example of ftrict juftice. It is thus related: Perillus, a brafs-founder at Athens, knowing the cruel difpofition of Phalaris, contrived a new fpecies of punifhment for him to inflict on his fubjects. He caft a brazen bull, bigger than the life, with an opening in the fide to admit the victims; who being fhut up in the body, a fire was kindled under it to roaft them to death; and the throat was fo contrived, that their dying groans refembled the roaring of a bull. The artift brought it to the tyrant, expecting a great reward. Phalaris admired the invention and workmanfhip, but ordered the inventor to be put into it to make the firft trial. In allufion to which, Ovid fays,

> ——— *Neque enim lex æquior ulla,*
> *Quam necis artifices arte perire fua.*

The end of this deteftable tyrant is differently related; but it is very generally believed, with Cicero, that he fell by the hands of the Agrigentines; and, as fome fuppofe, at the inftigation of Pythagoras. Ovid tells us, that his tongue was cut out; and that he was then put into the bull to perifh by the fame flow fire by which means he had murdered fo many before. Others fay that he was ftoned to death; and all agree that his end was violent. He reigned, Eufebius fays, 28 years; others fay 16. After all, there is great uncertainty both as to his life, death, and hiftory. Many of the circumftances related of him, as they are collected by Mr Boyle, depend upon the authenticity of thofe epiftles which go under the name of the tyrant; and which have been juftly queftioned, and with great probability rejected, as the fpurious production of fome modern fophift. See BENTLEY, p. 177. col. 2.

PHALARIS, or *Canary-grafs*, a genus of plants belonging to the triandria clafs. See BOTANY *Index*.

PHALERÆ, among the ancient Romans, were military rewards beftowed for fome fignal act of bravery. Authors do not agree whether the Phaleræ were a fuit of rich trappings for a horfe, or golden chains fomething like the torques, but fo formed as to hang down to the breaft and difplay a greater profufion of ornament. The laft opinion appears to have the greater prevalence, but perhaps both are true.

PHALEREUS (Nepos), a village and port of Athens; this laft neither large nor commodious, for which reafon Themiftocles put the Athenians on building the Piræus; both joined to Athens by long walls. The Phalereus lay nearer the city (Paufanias). Demetrius Phalereus, the celebrated fcholar of Theophraftus, was of this place; to whom the Athenians erected above 300 ftatues; which were afterwards deftroyed by his enemies, on his flight to Ptolemy king of Egypt (Strabo). Here Demofthenes was wont to declaim, to accuftom his voice to furmount the noife and roaring of the fea; a juft and lively emblem of popular affemblies.

PHALEUCIAN VERSE, in ancient poetry, a kind of verfe confifting of five feet; the firft of which is a fpondee, the fecond a dactyl, and the three laft trochees.

PHALLUS, the MOREL, a genus of plants of the order of fungi, and belonging to the cryptogamia clafs. See BOTANY *Index*.

PHALLUS, among the Egyptians, was the emblem of fecundity. It was very fervently worfhipped by women, efpecially by thofe who were barren. This cuftom was introduced among the Greeks; and feftivals in honour of it were called *phaluca*. See MYSTERIES, N° 38, &c. Among the Hindoos a fimilar emblem called *lingam* is ufed, and for fimilar purpofes. See HINDOOS, N° 4.

PHALTI, or PHALTIEL, fon of Laifh. He married Michal, after Saul had taken her from David; but David afterwards took her away from Phalti (1 Sam. xxv. 44. 2 Sam. iii. 15.). Some interpreters are of opinion

nion Phalti did not meddle with Michal all the time ſhe continued in his houſe, for fear that both of them ſhould incur the penalty of death, to be inflicted on adulterers (Levit. xx. 10.), becauſe Michal had not been legally divorced; but theſe reaſons are frivolous. Saul looked upon David as a rebel to his king, and an outlaw, whoſe goods and wives belonged to him, and which he could abſolutely diſpoſe of. He would not have given Michal to Phalti, nor would he have received her, if he had not thought he might uſe her as his wife. If Michal had no children by Phalti, by whom then were thoſe children that the ſcripture ſays ſhe had, ſince it is known ſhe had none by David? ſee 2 Sam. xxi. 8. and vi. 23.

PHANATIC, or FANATIC, a viſionary; one who fancies he ſees ſpectres, ſpirits, apparitions, or other imaginary objects, even when awake; and takes them to be real. See PHANTASY and FANATIC.

Such are phrenetics, necromancers, hypochondriac perſons, lycanthropi, &c. See PHRENETIC, HYPOCHONDRIAC, LYCANTHROPI.

Hence the word is alſo applied to enthuſiaſts, pretenders to revelation, new lights, prophecies, &c. See ENTHUSIAST, and SECOND *Sight*.

PHANTASIA was the daughter of Nicarchus of Memphis in Egypt. It has been ſuppoſed that ſhe wrote a poem on the Trojan war, and another on the return of Ulyſſes to Ithaca, from which compoſitions Homer copied the greateſt part of his Iliad and Odyſſey, when he viſited Memphis, where they were depoſited.

PHANTASM, a term ſometimes uſed in a ſynonymous ſenſe with idea, or notion retained in the mind, of an external object.

PHANTASMAGORIA, an optical deception. See SCIENCE, *Amuſements of*.

PHANTASY, or FANCY, the *Imagination*; one of the powers of the mind, by which the ſpecies of objects received by the external organs of ſenſe are retained, recalled, further examined, and either compounded, or divided: See IMAGINATION; and METAPHYSICS, Part I. Chap. ii. Or it is that internal ſenſe whereby the ideas of abſent things are formed, and repreſented to the mind as if they were preſent. In melancholics and madmen this faculty is very ſtrong, repreſenting many extravagant and monſtrous things, and framing its images as lively as thoſe of ſenſation: whence the viſions and deceptions thoſe perſons are liable to.

PHANUEL, of the tribe of Aſher, the father of a holy widow and propheteſs called Anna, who was in the temple when our Saviour was preſented there by his parents (Luke ii. 36, 37, 38.).

PHAON, a young man of Mytilene, in the iſland of Leſbos, received from Venus, as fable reports, an alabaſter vaſe filled with an eſſence which had the virtue of conferring beauty. He had no ſooner anointed his body with it than he became the moſt beautiful of men. The ladies of Mytilene fell deſperately in love with him; and the celebrated Sappho threw herſelf down a precipice becauſe he would not encourage her paſſion. He is ſaid to have been killed by a huſband who ſurpriſed him with his wife. We have in Ovid a letter from Sappho to Phaon, which Mr Pope has tranſlated into Engliſh verſe.

PHARA, in *Ancient Geography*, a village between Egypt and Arabia Petræa; or, according to Ptolemy, at a promontory ſituated between the Sinus Heroopolites and Elaniticus of the Red ſea; where Iſmael is ſaid to have dwelt. In Hebrew it is *Paran*, and in moſt interpreters; *Pharan*, Septuagint and Vulgate. *Pharanitæ*, the people (Ptolemy). *Paran* or *Pharan*, the name of the wilderneſs in its neighbourhood, adjoining to Cadeſh.

PHARÆ, in *Ancient Geography*, a town of Achaia in Peloponneſus, on the river Pierus, 70 ſtadia from the ſea, and to the ſouth of Patræ 150 ſtadia. Another, of Crete (Pliny); a colony from the *Pharæ* of Meſſenia (Stephanus). A third *Pharæ*, or *Pheræ* (Strabo, Ptolemy); *Phara*, *-æ*, (Polybius); a town of Meſſenia, on the river Nedo (Strabo); on the north ſide of the Sinus Meſſenius, and to the north-weſt of Abea. Anciently read *Pharis* in Homer (Pauſanias, Statius), though now read *Phare*. *Pharitæ* is the name of the people.

PHARAMOND is the name which is given by the generality of hiſtorians to the firſt king of France. He is ſaid to have reigned at Treves, and over a part of France, about the year 420; and to have been ſucceeded by his ſon Clodion: but the account which is given of theſe two princes is very uncertain. It is probable Pharamond was properly no more than a general of an army, the head of a military ſociety of Franks, who were maſters of their perſons and their fortunes. Gregory of Tours ſeems to have been of this opinion. "It is not generally known (ſays he) who was the firſt king of the French. Sulpitius Severus, who mentions ſeveral things reſpecting that nation, takes no notice of its firſt monarch; he only ſays that it had generals." Be that as it may, the inſtitution of the famous Salique law (ſo named from the Salians the moſt illuſtrious of the Franks) is generally attributed to Pharamond. "This law fixed the puniſhment of crimes, and various points of police. There is no juſt ground for believing that it expreſsly ſettled the right of ſucceſſion to the crown: it only ſays, that, with relation to the Salic land, women have no ſhare of heritage, without reſtricting it to the royal family in particular; for all thoſe were generally called *Salic lands* which were held by right of conqueſt; and it is eaſy to conceive that a nation of ſoldiers, whoſe general was their king, would not ſubmit to be governed by a woman. A long cuſtom, ſupported by the principles of the nation, came in time to be the eſtabliſhed law of the kingdom." (See *M. Abbé Millot, Elem. de l'Hiſtoire de France*, tom. i.).

PHARAOH, a common name of the kings of Egypt. Joſephus ſays, that all the kings of Egypt, from Minæus the founder of Memphis, who lived ſeveral ages before Abraham, have always had the name of Pharaoh, down to the times of Solomon, for more than 3300 years. He adds, that in the Egyptian language the word *Pharaoh* ſignifies a *king*; and that thoſe princes did not aſſume this name but when they aſcended the throne, at which time they quitted alſo their former name. From hence it comes to paſs, ſays Joſephus, that Herodotus names none of the kings of Egypt after Minæus the builder of Memphis, though he had 330 kings for his ſucceſſors, becauſe they had all the name of Pharaoh; but becauſe this name did not paſs to women alſo, he names an Egyptian queen Nicaule who ſucceeded

Pharaoh. succeeded them. Laftly, I find, adds Jofephus, from the ancient records of our nation, that from the age of Solomon no king of Egypt had any longer the name of Pharaoh.

But Jofephus is not very accurate in this paffage. True it is, Herodotus fays, that Mines, or Minæus, was the firft king of Egypt, and founder of Memphis; that there were 330 kings after him in Egypt; that after them there was a queen called Nicotris, and not Nicaule, as Jofephus writes it; but it is not true that thefe kings had no other name but Pharaoh. Herodotus fays exprefsly, that in the books of the Egyptian priefts were read the names and the catalogue of 330 kings; that in this number of 330 there were 18 Ethiopians, and a woman that was a foreigner called Nicotris, and that all the others were Egyptians. Thefe princes therefore had every one his proper name mentioned in the catalogue of the Egyptian kings. So likewife we fee in the fragments of Manetho, that every king of Egypt had a name peculiar to him; and we find the name Pharaoh only in Scripture.

What Jofephus adds concerning Queen Nicaule, or Nicotris, whom he pretends to be the fame as the queen of Sheba, of whom mention is made in Scripture (1 Kings x. 1, 2, &c.), is entirely fabulous; and as to what he fays, that fince the time of Solomon the kings of Egypt have no longer had the name of Pharaoh, is manifeftly falfe, fince we ftill find his name in the fecond book of Kings, under Hezekiah (2 Kings xviii. 21.); under Jofiah (xxiii. 29, 30, 33, &c.), where this name is joined to Necho, which was the proper name of this prince; under Jehoiakim (xxiii. 35); and in the prophets Ifaiah, Jeremiah, and Ezekiel, who are much later than Solomon. It is very probable that the Egyptians gave the name of Pharaoh to their kings as long as the Egyptian language was in common ufe, and as long as their kings were of their own nation: but after the conqueft of Egypt by Alexander the Great, and that the Grecians introduced their language with their government, the name of Pharaoh was known no longer among them. The firft prince known to us by the name of Pharaoh was he in whofe time Abraham went down to Egypt, when Sarah, who paffed only for Abraham's fifter, was by the command of Pharaoh brought to his palace in order to become his wife. See ABRAHAM. But the Lord fmote Pharaoh and his family with great infirmities, and gave him to know that fhe was Abraham's wife; whereupon Pharaoh fent for Abraham, reftored him his wife, and at the fame time gave orders that he fhould be conducted out of Egypt, with every thing that belonged to him. See SARAH.

The fecond Pharaoh fpoken of in the Scripture is he who reigned when Jofeph arrived there. This prince or his fucceffor had the myfterious dream of the fat and lean kine, and the feven full and barren ears of corn, which Jofeph explained fo much to his fatisfaction, that he made him governor of his houfe and of all Egypt, referving only to himfelf the name of a king. This is the fame Pharaoh who fent for and entertained the patriarch Jacob and his family in Egypt, and gave them the land of Gofhen for their habitation. See JOSEPH and JACOB.

The third Pharaoh known in holy writ is he who perfecuted the Ifraelites. Mofes tells us that he was a new king, and had no knowledge of Jofeph (Exod. i. 8.). This prince, obferving that the Ifraelites had become very numerous and powerful, refolved to deprefs them by hardfhip and labour; and fet cruel and pitilefs taskmafters over them. But the more he oppreffed them, the fafter they multiplied; infomuch that he gave orders to the Egyptian midwives, who affifted the Hebrew women in their labour, to put all the male children to death, and to fave alive the females only. But this command was not ftrictly executed. The midwives feared the Lord, and preferved alive not only the female children, but the males alfo.

Pharaoh, feeing this project did not fucceed to his wifhes, publifhed a decree (Exod. i. 22.) that all the male children born of Hebrew women fhould be thrown into the Nile, and that only the females fhould be fpared. This order was rigoroufly executed; yet by the providence of God Mofes was preferved, and even brought up in Pharaoh's own court, by his own daughter, who by chance had found the child, as he was expofed upon the Nile.

Mofes being grown up, and having killed an Egyptian who had abufed an Hebrew, was obliged to fly from Egypt to avoid that death that Pharaoh had threatened him with.

Several years after, being about 80 years old, he returned again by an order from God, and performed mighty miracles before Pharaoh. See MOSES. There is a good deal of probability that this Pharaoh before whom Mofes appeared, and in whofe fight he fmote Egypt with fo many plagues, was a different perfon from him who would have laid hands on him after he had flain the Egyptian. This fame Pharaoh having at laft been compelled to fend away the Hebrews, and to fuffer them to go out of Egypt, foon repented of the leave he had given, and purfued them at the head of his army with his chariots. But he was drowned in the Red fea, wherein he had rafhly entered in the eagernefs of his purfuit. Some hiftorians pretend to give us the name of this Pharaoh; fome, as Apion, call him Amofis or Amafis; Eufebius calls him Chenchris; Ufher calls him Amenophis; but we may affure ourfelves that there can be nothing certain in all this.

The fifth Pharaoh known to us is he who gave protection to Hadad fon of the king of Edom, who gave him to wife the fifter of his own queen, enriched him with lands, and brought up his fon Genubah in his own court. Hadad returned to Idumea after the death of David.

The fixth Pharaoh is he who gave his daughter in marriage to Solomon king of the Hebrews (1 Kings iii. 1.); and having taken Gezer, he fet it on fire, drove the Canaanites out of it, and gave it for a prefent to Solomon, in lieu of a dowry for his daughter, whom he had married to this prince (1 Kings ix. 16.).

The feventh is Shifhak, who entertained Jeroboam in his dominions, a rebellious fubject of Solomon, and offered him a refuge in oppofition to the king his mafter. The fame Shifhak declared war againft Rehoboam the fon and fucceffor of Solomon, befieged and took Jerufalem, carried away all the king's treafures, and thofe of the houfe of God, and particularly the golden bucklers that Solomon had made. See SHISHAK.

The eighth is that Pharaoh with whom Hezekiah made a league againft Sennacherib king of Affyria, in the year of the world 3290. See SENNACHERIB. This Pharaoh is probably the fame whom Herodotus names Sethon,

Sethon, prieſt of Vulcan, who came to meet Sennacherib before Peluſium, and to whoſe aſſiſtance Vulcan ſent an army of rats, which gnawed the bowſtrings and the thongs of the bucklers of Sennacherib's ſoldiers.

The ninth is Pharaoh Necho, or Nechos, ſon of Pſammiticus, who made war with Joſiah, and ſubdued him. Herodotus alſo mentions this prince. See Necho and Egypt, Nº 11.

The tenth is Pharaoh Hophrah, who entered into an alliance with Zedekiah king of Judah, and attempted to come to his aſſiſtance againſt Nebuchadnezzar king of Chaldea. It was againſt this Pharaoh that Ezekiel pronounced ſeveral of his prophecies (ſee Ezekiel xxix. xxx. xxxi. xxxii.). He is called Apries in Herodotus, lib. ii. c. 161. He is alſo mentioned in Habakkuk ii. 15, 16. See alſo Iſaiah xix. xx. and Jeremiah xlvi. 16, &c. See Apriès, and Egypt, Nº 13, &c.

PHARAON is the name of a game of chance, the principal rules of which are: the banker holds a pack conſiſting of 52 cards; he draws all the cards one after the other, and lays them down alternately at his right and left hand; then the ponte may at his pleaſure ſet one or more ſtakes upon one or more cards, either before the banker has begun to draw the cards, or after he has drawn any number of couples. The banker wins the ſtake of the ponte when the card of the ponte comes out in an odd place on his right hand, but loſes as much to the ponte when it comes out in an even place on his left hand. The banker wins half the ponte's ſtake when it happens to be twice in one couple. When the card of the ponte being but once in the ſtock happens to be the laſt, the ponte neither wins nor loſes; and the card of the ponte being but twice in the ſtock, and the laſt couple containing his card twice, he then loſes his whole ſtake. De Moivre has ſhown how to find the gain of the banker in any circumſtance of cards remaining in the ſtock, and of the number of times that the ponte's cards is contained in it. Of this problem he enumerates four caſes, viz. when the ponte's card is once, twice, three, or four times in the ſtock. In the firſt caſe, the gain of the banker is $\frac{1}{n}$, n being the number of cards in the ſtock. In the ſecond caſe, his gain is $\frac{\overline{n-2\times y}}{n\times \overline{n-1}}+\frac{2}{n\times \overline{n-1}}$, or $\frac{\frac{1}{2}n+1}{n\times \overline{n-1}}$, ſuppoſing $y=\frac{1}{2}$. In the third caſe, his gain is $\frac{3y}{2\times \overline{n-1}}$, or $\frac{3}{n\times \overline{n-1}}$, ſuppoſing $y=\frac{1}{2}$. In the fourth caſe, the gain of the banker, or the loſs of the ponte, is $\frac{2n-5}{\overline{n-1}\times \overline{n-3}}y$, or $\frac{2n-5}{2\times \overline{n-1}\times \overline{n-3}}$ ſuppoſing $y=\frac{1}{2}$. De Moivre has calculated a table, exhibiting this gain or loſs for any particular circumſtance of the play; and he obſerves, that at this play the leaſt diſadvantage of the ponte, under the ſame circumſtances of cards remaining in the ſtock, is when the card of the ponte is but twice in it, the next greater when three times, the next when once, and the greateſt when four times. He has alſo demonſtrated, that the whole gain per cent. of the banker, upon all the money that is adventured at this game, is 2l. 19s. 10d. See De Moivre's Doctrine of Chances, p. 77, &c. p. 105, &c.

PHAREZ, ſon of Judah and Tamar (Gen. xxxviii. 27, 28, &c.). Tamar being juſt ready to lie in, found herſelf with child of twins. One of them appeared firſt, and putting his arm out, he immediately drew it back again. The midwife tied a ſcarlet thread upon his arm, to diſtinguiſh him for the firſt-born; but having withdrawn his hand, his brother got before him into the world: whereupon he was called by his mother *Pharez*, i. e. *one breaking forth*; as the other, with the thread on his hand, was called *Zarah*. The ſons of Pharez were Hezron and Hamul (Numb. xxvi. 20, 21.). F. Calmet, upon this article, explains the text as if Pharez, and not Zarah, had put out his hand, and drew it in again.

* PHARISEES, a famous ſect of the Jews, who diſtinguiſhed themſelves by their zeal for the traditions of the elders, which they derived from the ſame fountain with the written word itſelf; pretending that both were delivered to Moſes from Mount Sinai, and were therefore both of equal authority. From their rigorous obſervance of theſe traditions, they looked upon themſelves as more holy than other men; and therefore ſeparated themſelves from thoſe whom they thought ſinners or profane, ſo as not to eat or drink with them; and hence, from the Hebrew word *pharic*, which ſignifies "to ſeparate," they had the name of *Phariſees* or *Separatiſts*.

This ſect was one of the moſt ancient and conſiderable among the Jews; but its original is not very well known (A); however, it was in great repute in the time of our Saviour; and muſt have had its original at the ſame time with the traditions, and they grew up together,

(A) The Jeſuit Serrarius places their firſt riſe about the time of Eſdras; becauſe it was then that the Jews firſt began to have interpreters of their traditions. Maldonat, on the other hand, will not have this ſect to have ariſen among the Jews till a little before the time of Chriſt. Others, perhaps, with more probability, refer the origin of the Phariſees to the time of the Maccabees.

Dr Lightfoot thinks, that Phariſaiſm roſe up gradually, from a period which he does not aſſign, to the maturity of a ſect. It is certain, from the account given by Joſephus, that in the time of John Hyrcanus, the high prieſt and prince of the Aſmonean line, about 108 years before Chriſt, the ſect was not only formed, but made a conſiderable figure; and that it had advanced to a high degree of popularity and power about 80 years before Chriſt. Joſ. Ant. lib. xiii. cap. 10. § 5, 6. cap. 15. § 5. and cap. 16. § 1. According to Baſnage, Hiſt. of the Jews, book ii. cap. 9. § 2. one Ariſtobulus, an Alexandrian Jew, and a Peripatetic philoſopher, who flouriſhed about 125 years before Chriſt, and wrote ſome allegorical commentaries on the ſcripture, was the author of thoſe traditions, by an adherence to which the Phariſees were principally diſtinguiſhed from other ſects.

Pharisees. gether, till at length they had gained ground so far, that the traditional law swallowed up the written, and those who were the propagators of it the whole bulk of the Jewish nation.

The extraordinary pretences of the Pharisees to righteousness drew after them the common people, who held them in the highest esteem and veneration. Our Saviour frequently, however, charges them with hypocrisy, and making the law of God of no effect through their traditions (Matth. ix. 2. xv. 1—6. xxiii. 13—33. and Luke xi. 39—52.). Several of these traditions are particularly mentioned in the gospel; but they had a vast number more, which may be seen in the Talmud, the whole subject whereof is to dictate and explain those traditions which this sect imposed to be believed and observed.

The Pharisees, contrary to the opinion of the Sadducees, held a resurrection from the dead, and the existence of angels and spirits (Acts xxiii. 8.). But according to Josephus, this resurrection of theirs was no more than a Pythagorean resurrection, that is, of the soul only, by its transmigration into another body, and being born anew with it. From this resurrection they excluded all that were notoriously wicked, being of opinion that the souls of such persons were transmitted into a state of everlasting woe. As to lesser crimes, they held they were punished in the bodies which the souls of those who committed them were next sent into.

Josephus, however, either mistook the faith of his countrymen, or, which is more probable, wilfully misrepresented it, to render their opinions more respected by the Roman philosophers, whom he appears to have on every occasion been desirous to please. The Pharisees had many pagan notions respecting the soul; but Bishop Bull, in his *Harmonia Apostolica*, has clearly proved, that they held a resurrection of the body, and that they supposed a certain bone to remain uncorrupted, to furnish the matter of which the resurrection body was to be formed. They did not, however, believe that all mankind were to be raised from the dead. A resurrection was the privilege of the children of Abraham alone, who were all to rise on Mount Zion; their incorruptible bones, wherever they might be buried, being carried to that mountain below the surface of the earth. The state of future felicity, in which the Pharisees believed, was very gross: They imagined, that men in the next world, as well as in the present, were to eat and drink, and enjoy the pleasures of love, each being reunited to his former wife. Hence the Sadducee, who believed in no resurrection, and supposed our Saviour to teach it as a Pharisee, very shrewdly urged the difficulty of disposing of the woman who had in this world been the wife of seven husbands. Had the resurrection of Christianity been the Pharisaical resurrection, this difficulty would have been insurmountable; and accordingly we find the people, and even some of the Pharisees themselves, struck with the manner in which our Saviour removed it.

This sect seems to have had some confused notions, probably derived from the Chaldeans and Persians, respecting the pre-existence of souls; and hence it was that Christ's disciples asked him concerning the blind man (John ix. 2.), 'Who did sin, this man or his parents, that he was born blind?' And when the disciples told Christ, that some said he was Elias, Jeremias, or one of the prophets (Matt. xvi. 14.), the meaning can only be, that they thought he was come into the world with the soul of Elias, Jeremias, or some other of the old prophets, transmigrated into him. With the Essenes, they held absolute predestination; and with the Sadducees free-will: but how they reconciled these seemingly incompatible doctrines is nowhere sufficiently explained. The sect of the Pharisees was not extinguished by the ruin of the Jewish commonwealth. The greatest part of the modern Jews are still of this sect; being as much devoted to traditions or the oral law as their ancestors were. See the articles CABBALISTS, CARAITES, ESSENES, SADDUCEES, &c.

Pharisees ‖ Pharos.

PHARMACA, among the ancients, meant medicated or enchanted compositions of herbs, minerals, &c. some of which, when taken inwardly, were supposed to cause blindness, madness, love, &c.: others infected by touch; such was the garment sent by Medea to Creusa, prepared *secundum artem*: and others operated upon persons at a distance. *Pharmaca soteria* were employed as antidotes against these mischievous compositions: Thus the herb *moly* preserved Ulysses from the magical influence of Circe. The laurel, the rhamnus, the flea-bane, the jasper-stone, were used for similar purposes. See *Potter's Græc. Ant.*

PHARMACI, were two persons who were employed in the lustration or purification of cities. Some say they were both men; but others maintain, that a man to represent the males, and a woman to represent the females, performed this office. They performed sacrifice, and wore figs about their necks called ισχαδες; those of the man were blackish, and those of the woman white. Figs were an emblem of fertility, which they doubtless prayed for on these solemn occasions.

PHARMACEUTICAL, any thing connected with pharmacy, or the operations or processes employed in the preparation of medicines.

PHARMACOCHEMIA, an old term denoting that part of the chemical art which treats of the preparation of medicines; by way of distinction from that chemistry, which is wholly employed about the transmutation of metals by means of the philosopher's stone; this being called *spagirico-chemia.*

PHARMACOLOGY, is a treatise of medicines, or the art of preparing, judging of them, &c.

PHARMACOPOEIA (from φαρμακον, *remedy*, and ποιειν, *to make*), means a dispensatory, or a treatise describing the preparations of the several kinds of medicines, with their uses, manner of application, &c.

We have various pharmacopœias, as those of Bauderon, Quercetan, Zwelfer, Charas, Bates, Salmon, Lemery, Lewis, &c. But the Edinburgh, London, and Dublin pharmacopœias, are chiefly consulted and followed in Britain in the present day.

PHARMACOPOLA, or PHARMACOPEIUS, an apothecary, or a person who prepares and sells medicines; but this word is rarely used but in the way of ridicule. It is composed of φαρμακον, *medicine*, and πωλειν, *to sell.* Hor. Sat. ii. lib. i. ver. 1.

PHARMACUM, φαρμακον, a medicine or medicament, either of a salutary or deleterious quality.

PHARMACY, the art of preparing, preserving, and compounding medicines. See MATERIA MEDICA. See also PRESCRIPTIONS, *Extemporaneous.*

PHAROS, (Homer, Strabo, &c.), a small oblong island,

Pharos ‖ Pharsalia.

island, adjoining to the continent of Egypt, over-against Alexandria. On this island stood a cognominal light-tower, of four sides, each side a stadium in length; and the tower so high as to be seen 100 miles off. Some affirm, each of its four corners rested on a large sea-crab of glass or of hard transparent stone of Ethiopia or Memphis. Others imagine the crabs were only added externally to the base by way of ornament, or as emblematical of its situation and use. The architect was Sostrates the Cnidian, as appears by an inscription on the tower, under Ptolemy Philadelphus, who laid out 800 talents upon it. On account of the port of Alexandria, the entrance to which was difficult and dangerous, the Pharos was called *the key of the Egyptian sea*, or even of Egypt itself (Lucan): and Pharos, from being a proper name, became an appellative to denote all light-houses.

Pharos, or *Phare*, a light-house; a pile raised near a port, where fire is kept burning in the night, to guide and direct vessels near at hand. The pharos of Alexandria, built in the island of Pharos, at the mouth of the Nile, was anciently very famous, insomuch as to communicate its name to all the rest. This most magnificent tower consisted of several stories and galleries, with a lantern at top, in which a light being continually burning, might be seen for many leagues at sea, and along the coast. It was accounted one of the seven wonders of the world. It was built by the famed architect Sostrates, a native of Cnidos, or, according to some, by Deiphanes, the father of Sostrates; and cost Ptolemy Philadelphus 800 talents. The several stories were adorned with columns, ballustrades, galleries of the finest marble and workmanship; to which some add, that the architect had contrived to fasten some looking-glasses so artificially against the highest galleries, that one could see in them all the ships that sailed on the sea for a great way. Instead of which noble structure, one sees now only a kind of irregular castle, without ditches or outworks of any strength, the whole being accommodated to the inequality of the ground on which it stands, and which it seems is no higher than that which it should command. Out of the midst of this clumsy building rises a tower, which serves for a light-house, but which has nothing of the beauty and grandeur of the the old one. The Colossus of Rhodes also served as a pharos.

PHARPAR, or Pharphar, is one of the rivers of Damascus, or rather it is an arm of the Barrady or Chrysorrhoas, which waters the city of Damascus and the country about it (2 Kings v. 12.). "Are not Abana and Pharpar, rivers of Damascus, better than all the waters of Israel?" The river of Damascus has its fountain in the mountains of Libanus. At its approach to the city it is divided into three arms, one of which passes through Damascus. The other two water the gardens round about, and then reuniting, they lose themselves at four or five leagues from the city, towards the north. See *Maundrell's Travels from Aleppo to Jerusalem*; see also the articles Abana and Damascus.

PHARSALIA, Pharsalium, *Pharsalus*, or *Pharsalos*, in *Ancient Geography*, a town of the Phthiotes, a district of Thessaly, near Pheræ and Larissa, to which last place Pompey fled from the plains of Pharsalus; watered by the river Enipeus, which falls into the Apidanus, and both together into the Peneus. Between Pharsalus and Enipeus, Pompey drew up his men at the fatal battle of Pharsalia.

Pharsalia.

In this battle, the advantage with respect to numbers was greatly on the side of Pompey. That general himself was on the left with the two legions which Cæsar had returned to him at the beginning of the war. Scipio, Pompey's father-in-law, was in the centre, with the legions he had brought from Syria, and the reinforcements sent by several kings and states of Asia. The Cilician legion, and some cohorts which had served in Spain, were in the right, under the command of Afranius. As Pompey's right wing was covered by the Enipeus, he strengthened the left with his slingers, archers, and the 7000 Roman horse, on whom chiefly his party founded their hopes of victory. The whole army was drawn up in three lines, with very little spaces between them. In conformity to this disposition, Cæsar's army was drawn up in the following order: The tenth legion, which had on all occasions signalized itself above all the rest, was placed in the right wing, and the ninth in the left; but as the latter had been considerably weakened in the action at Dyrrhachium, the eighth legion was posted so near as to be able to support and reinforce it upon occasion. The rest of Cæsar's forces filled up the space between the two wings. Mark Antony commanded the left wing, Sylla the right, and Cneius Domitius Calvinus the main body. As for Cæsar, he posted himself in the right over-against Pompey, that he might have him always in his sight.

Thus was the whole plain covered, from Pharsalia to the Enipeus, with two armies, dressed and armed after the same manner, and bearing the same ensigns, the Roman eagles. Pompey observing how well the enemy kept their ranks, expecting quietly the signal of battle, and on the contrary how impatient and unsteady his own men were, running up and down in great disorder for want of experience, he began to be afraid lest his ranks should be broken upon the first onset; and therefore commanded the foot in the front to keep their ground, and quietly wait for the enemy. The two armies, though within reach of each other, kept a mournful silence; but at length the trumpets sounded the charge, and Cæsar's army advanced in good order to begin the attack, being encouraged by the example of one Caius Crastinus, a centurion, who at the head of 120 men, threw himself upon the enemy's first line with incredible fury. This he did to acquit himself of a promise he had solemnly made to Cæsar, who, meeting him as he was going out of his tent in the morning, asked him, after some discourse, *What his opinion was touching the event of the battle?* To which he, stretching out his hand, replied aloud, *Thine is the victory, Cæsar; thou shalt gloriously conquer, and I myself this day will be the subject of thy praise either dead or alive.* In pursuance of this promise he broke out of his rank as soon as the trumpet sounded; and, at the head of his company, ran in upon the enemy, and made great slaughter of them. But while he was still pressing forward, forcing his way through the first line, one of Pompey's men ran him in at the mouth with such violence, that the point of his sword came out at the hind part of his neck. Upon his death Pompey's soldiers took courage, and with great bravery stood the enemy's onset. While the foot were thus sharply

Pharsalia. sharply enaged in the centre, Pompey's horse in the left wing marched up confidently; and having first widened their ranks, with a design to surround Cæsar's right wing, charged his cavalry, and forced them to give ground. Hereupon Cæsar ordered his horse to retreat a little, and give way to the six cohorts, which he had posted in the rear as a body of reserve. These, upon a signal given, coming up, charged the enemy's horse with that resolution and good order which is peculiar to men who have spent all their lives in camps. They remembered their instructions, not striking at the legs or thighs of the enemy, but aiming only at their faces. This unexpected and new manner of fighting had the desired effect. For the young patricians, whom Cæsar contemptuously calls the *pretty young dancers*, not being able to bear the thoughts of having their faces deformed with scars, turned their backs, and, covering their faces with their hands, fled in the utmost confusion, leaving the foot at the mercy of the enemy. Cæsar's men did not pursue the fugitives; but charging the foot of that wing, now naked and unguarded, surrounded them, and cut most of them in pieces.

Pompey was so transported with rage, in seeing the flower of his forces thus put to flight or cut in pieces, that he left his army, and retired slowly towards his camp, looking more like a man distracted and beside himself than one who by his exploits had acquired the name of *the Great*. When he had reached the camp, he retired to his tent without speaking a word to any; and continued there, like one distracted and out of his senses, till his whole army was defeated. Cæsar no sooner saw himself master of the field than he marched to attack the enemy's entrenchments, that Pompey might not have time to recollect himself. When Pompey was informed that his rival was advancing to attack his entrenchments, he then first seemed to have recovered his senses, and cried out, *What, into my camp too!* He said no more; but immediately laying aside the marks of his dignity, and putting on such a garment as might best favour his flight, he stole out at the decuman gate, and took the road to Larissa, which city had hitherto shown great attachment to him. In the mean time Cæsar began the attack on the enemy's camp, which was vigorously defended by the cohorts Pompey had left to guard it; but they were at length forced to yield. Cæsar was not a little surprised, when, after having forced the entrenchments, he found the enemy's tents and pavilions richly adorned with carpets and hangings, their couches strewed with flowers, their tables ready spread, and sideboards set out with abundance of plate, bowls, and glasses, and some of them even filled with wine. So great was the confidence of Pompey's party, that they made preparations beforehand for pleasures to be enjoyed after the victory, which they thought certain. In Pompey's tent, Cæsar found the box in which he kept his letters: but, with a moderation and magnanimity worthy of himself, he burnt them all, without reading one; saying, that he had rather be ignorant of crimes, than obliged to punish them.

The next day, when the dead were numbered, it appeared that Cæsar had scarce lost 200 men; among whom were about 30 centurions, whom Cæsar caused to be buried with great solemnity. He did particular honours to the body of Crastinus, who had begun the battle; and ordered his ashes to be deposited in a tomb, which he erected to his memory. On Pompey's side, the number of the dead amounted to 15,000 according to some, and to 25,000 according to others. Cæsar took 24,000 prisoners, eight eagles, and 180 ensigns.

PHARSALIA, an epic poem, composed by Lucan on the civil war between Pompey and Cæsar, and particularly on the victory of the latter over the former, of which we have given an account in the preceding article. It is a poem universally acknowledged to have great beauties and great defects; but we are the less capable of estimating its merit as a whole, that either time has deprived us of the last books, or its author has left it incomplete. "The subject of the Pharsalia (says an excellent critic) carries undoubtedly all the epic grandeur and dignity: neither does it want unity of object, viz. the triumph of Cæsar over the Roman liberty. In the choice of that subject, he thinks, however, that the author was not happy. The civil wars were too recent to admit in the description of them the embellishments of fiction and machinery. The fables of the gods mixed with the exploits of Cæsar and Pompey, instead of raising, would have diminished, the dignity of such well known facts." Another objection to the subject, perhaps more forcible than this, arises from the success of the war and the abilities of the generals. Lucan was a friend to liberty, and wished to raise the character of Pompey and Cato; but in spite of his utmost efforts, they are always eclipsed by the superior talents and consequent success of Cæsar. All his characters, however, are drawn with spirit, and with uncommon regard to truth; and some of the speeches which he puts into the mouths of his heroes are equal for moral sublimity to any thing that is to be found in all antiquity. Blair's Lectures.

"There are in the Pharsalia (continues the critic already quoted) several very poetical and spirited descriptions. But the author's chief strength does not lie either in narration or description. His narration is often dry and harsh; his descriptions are often overwrought, and employed too upon disagreeable objects. His principal merit consists in his sentiments, which are generally noble and striking, and expressed in that glowing and ardent manner which peculiarly distinguishes him. Lucan is the most philosophical and the most public-spirited poet of all antiquity. He was the nephew of the famous Seneca the philosopher; was himself a Stoic; and the spirit of that philosophy breathes throughout his poem. We must observe, too, that he is the only ancient epic poet whom the subject of his poem really and deeply interested. Lucan recounted no fiction. He was a Roman, and had felt all the direful effects of the Roman civil wars, and of that severe despotism which succeeded the loss of liberty. His high and bold spirit made him enter deeply into this subject, and kindle, on many occasions, into the most real warmth. Hence, he abounds in exclamations and apostrophes, which are almost always well-timed, and supported with a vivacity and fire that do him no small honour.

"But it is the fate of this poet, that his beauties can never be mentioned, without their suggesting his blemishes also. As his principal excellency is a lively and glowing

glowing genius, which appears sometimes in his descriptions, and very often in his sentiments, his great defect in both is want of moderation. He carries every thing to an extreme. He knows not where to stop. From an effort to aggrandize his objects, he becomes tumid and unnatural: and it frequently happens, that where the second line of one of his descriptions is sublime, the third, in which he meant to rise still higher, is perfectly bombast. Lucan lived in an age when the schools of the declaimers had begun to corrupt the eloquence and taste of Rome. He was not free from the infection; and too often, instead of showing the genius of the poet, betrays the spirit of the declaimer; but he is, on the whole, an author of lively and original genius."

PHARUS, a genus of plants belonging to the monœcia class; and in the natural method ranking under the fourth order, *Gramina*. See BOTANY *Index*.

PHARYNX. See ANATOMY, N° 92.

PHASCUM, a genus of plants of the order of musci, belonging to the cryptogamia class. See BOTANY *Index*.

PHASEOLUS, the KIDNEY-BEAN; a genus of plants, belonging to the diadelphia class. See BOTANY *Index*.

PHASES, in *Astronomy*, from the Greek word φαινω, "to appear;" the several appearances or quantities of illumination of the moon, Venus, Mercury, and the other planets. See ASTRONOMY.

PHASGA, or PISGAH, (Moses), a mountain on the other side Jordan, joined to Abarim and Nebo, and running south to the mouth of the Arnon: from which Moses had a view of the promised land, and where he died, having before appointed Joshua his successor. Wells takes Pisgah and Nebo to be different names of one and the same mountain, a part or branch of the mountains Abarim (Deut. xxxii. 49. compared with Deut. xxxiv. 1.). Or that the top of Nebo was peculiarly called *Pisgah*; or some other part of it, cut out in steps, as the primitive word denotes: and thus it is rendered by Aquila, by a Greek word signifying *cut out* (Jerome). There was also a city of this name, *id.*; and the adjoining country was in like manner called *Pisgah*, id.

PHASIANUS, a genus of birds belonging to the order of gallinæ. See ORNITHOLOGY *Index*.

PHASIS, a river which falls into the Euxine sea about 700 miles from Constantinople. "From the Iberian Caucasus (says Gibbon), the most lofty and craggy mountains of Asia, that river descends with such oblique vehemence, that in a short space it is traversed by 120 bridges. Nor does the stream become placid and navigable till it reaches the town of Sarapana, five days journey from the Cyrus, which flows from the same hills, but in a contrary direction, to the Caspian lake. The proximity of these rivers has suggested the practice, or at least the idea, of wafting the precious merchandise of India down the Oxus, over the Caspian, up the Cyrus, and with the current of the Phasis into the Euxine and Mediterranean seas. As it successively collects the streams of the plain of Colchos, the Phasis moves with diminished speed, though accumulated weight. At the mouth it is 60 fathoms deep, and half a league broad; but a small woody island is interposed in the midst of the channel: the

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water, so soon as it has deposited an earthy or metallic sediment, floats on the surface of the waves, and is no longer susceptible of corruption. In a course of 100 miles, 40 of which are navigable for large vessels, the Phasis divides the celebrated region of Colchos or Mingrelia, which, on three sides, is fortified by the Iberian and Armenian mountains, and whose maritime coast extends about 200 miles, from the neighbourhood of Trebizond to Dioscurias and the confines of Circassia. Both the soil and climate are relaxed by excessive moisture: 28 rivers, besides the Phasis and his dependent streams, convey their waters to the sea; and the hollowness of the ground appears to indicate the subterraneous channels between the Euxine and the Caspian."

PHASMATA, in *Physiology*, certain appearances arising from the various shades of colour in the clouds by the light from the heavenly bodies, especially the sun and moon. These are infinitely diversified by the different figures and situations of the clouds, and the appulses of the rays of light; and, together with the occasional flashings and shootings of different meteors, they have, no doubt, occasioned those prodigies of armies fighting in the air, &c. of which we have such frequent accounts in many writers. See 2 Maccab. xi. 8. Melancth. Meteor. 2. Shel. de Comet. ann. 1618.

Kircher and Schottus have erroneously attempted to explain the phenomenon from the reflection of terrestrial objects made on opaque and congealed clouds in the middle region of the air, which, according to them, have the effect of a mirror. Thus, according to those authors, the armies pretended by several historians to have been seen in the skies, were no other than the reflection of the like armies placed on some part of the earth. See *Hist. Acad. Roy. Scienc. ann.* 1726, p. 405, *et seq.*

PHEASANT. See PHASIANUS, ORNITHOLOGY *Index*.

PHEASANT'S Eye, or *Bird's Eye*. See ADONIS, BOTANY *Index*.

PHEBE, a deaconess of the port of Corinth, called *Cenchrea*. St Paul had a particular esteem for this holy woman; and Theodoret thinks the apostle lodged at her house for some time, while he continued in or near Corinth. It is thought she brought to Rome the epistle he wrote to the Romans, wherein she is commended and recommended in so advantageous a manner. He says (Rom. xvi. 1, 2.), "I commend unto you Phebe our sister, which is a servant of the church which is at Cenchrea: that ye receive her in the Lord, as becometh saints, and that ye assist her in whatsoever business she hath need of you; for she hath been a succourer of many, and of myself also." Some moderns have advanced a notion, that Phebe was wife to St Paul; but none of the ancients have said any thing like it. It is thought, in quality of deaconess, she was employed by the church in some ministrations suitable to her sex and condition; as to visit and instruct the Christian women, to attend them in their sickness, and distribute alms to them.

PHEGOR, or PEOR, a deity worshipped at a very early period by the Midianites and Moabites, and probably by all the other tribes which then inhabited Syria. Much has been said concerning the functions of this god, and the rank which he held among the Pagan

gan divinities (see *BAAL-Peor*); and many conjectures have been formed concerning the origin of his name. Most of these seem to have no better foundation than the senseless dreams of the Jewish rabbies. PHEGOR, or PEOR, is undoubtedly the same with the Hebrew word *pechor*, which signifies *aperuit*, and probably refers to the prophetic influence always attributed to the solar deity, by which he *opened* or *discovered* things to come. Accordingly we find PHEGOR or PEOR generally joined to *Baal*, which was the Syrian and Chaldean name of the sun after he became an object of worship; hence *Baal-PHEGOR* must have been the sun worshipped by some particular rites, or under some particular character. What these were, a resolution of *Pechor* into its component parts may perhaps inform us. As this word, wherever it occurs in Scripture, has some relation to distending or opening the mouth wide, it is probably compounded of PHAH the *mouth* or *face*, and EHAR *naked*. In those countries we know that the women wore veils; but it would appear, that in celebrating the rites of this deity they were unveiled. It seems even not improbable, that on these occasions the sexes danced promiscuously without their clothes; a practice which would naturally give birth to the licentious amours mentioned in the 25th chapter of the book of Numbers. If this be admitted, it will follow that *Phegor* was the sun presiding over the mysteries of Venus.

PHELLANDRIUM, WATER-HEMLOCK; a genus of plants belonging to the pentandria class. See BOTANY *Index*.

PHENGITES, among the ancients, the name of a beautiful species of alabaster. It is a rude irregular mass, very shattery and friable, but of a brightness superior to that of most other marbles, and excelling them all in transparence. The colour is an agreeable pale, yellowish white, or honey colour; the yellowish is more intense in some places than in others, and sometimes makes an obscure resemblance of veins. It is very weak and brittle in the mass; and when reduced to small pieces, may be easily crumbled between the fingers into loose, but considerably large angular pieces, some perfect, others complex, irregular, or mutilated, and all approaching to a flat shape. The ancients were very fond of this species in public buildings; and the temple of Fortune, built entirely of it, has long been celebrated. Its great beauty is its transparence, from which alone this temple was perfectly light when the doors were shut, though it was built without a window, and had no other light but what was transmitted through the stone of which the walls were built. It was anciently found in Cappadocia, and is still plentiful there: we have it also in Germany and France, and in our own kingdom in Derbyshire, and some other counties. It takes an excellent polish, and is very fit for ornamental works, where no great strength is required.

Hill's Hist. of Fossils, p. 490.

PHENICE, a port of the island of Crete, to the west of the island. St Paul having anchored at Phenice, when he was carried to Rome (Acts xxvii. 12.), advised the ship's crew to spend the winter there, because the season was too far advanced.

PHENICIA. See PHOENICIA.

PHEONS, in *Heraldry*, the barbed heads of darts, arrows, or other weapons.

PHEOS, in *Botany*, a name which Theophrastus, Dioscorides, and others, give to a plant used by fullers in dressing their cloths, and of which there were two kinds, a smaller called simply *pheos*, and a larger called *hippopheos*. This plant is sometimes called *phleos*; and is thus confounded with a kind of marsh cudweed, or *gnaphalium*, called also by that name; but it may always be discovered which of the two plants an author means, by observing the sense in which the word is used, and the use to which the plant was put. The *phleos*, properly so called, that is, the cudweed, was used to stuff beds and other such things, and to pack up with earthen vessels to prevent their breaking; but the pheos, improperly called *phleos*, only about cloths: this was, however, also called *stœbe* and *cnaphon*.

PHERECRATES, a Greek comic poet, was contemporary with Plato and Aristophanes. After the example of the ancient comedians, who never introduced upon the theatre imaginary but living characters, he acted his contemporaries. But he did not abuse the liberty which at that time prevailed upon the stage; and laid it down as a rule to himself never to destroy the reputation of any person. Twenty-one comedies are attributed to him, of which there now only remain some fragments collected by Hertelius and Grotius. From these fragments, however, it is easy to discern, that Pherecrates wrote the purest Greek, and possessed that ingenious and delicate raillery which is called *attic urbanity*. He was author of a kind of verse called, from his own name, *Pherecratick*. The three last feet were in hexameter verse, and the first of those three feet was always a spondee. This verse of Horace (for example, *Quamvis pontica pinus*) is a Pherecratick verse. We find in Plutarch a fragment of this poet upon the music of the Greeks, which has been critically examined by M. Burette of the academy of inscriptions. See the 15th volume of the collection published by that learned society.

PHERECYDES, a native of Scyros, flourished about the year 560 before the Christian era, and was disciple of Pittacus, one of the seven wise men of Greece (see PITTACUS). He is said to have been the first of all the philosophers who has written on natural subjects and the essence of the gods. He was also the first, it is said, who held the ridiculous opinion, "that animals are mere machines." He was Pythagoras's master, who loved him as his own father. This grateful scholar having heard that Pherecydes lay dangerously ill in the island of Delos, immediately repaired thither, in order to give every necessary assistance to the old man, and to take care that no means should be left untried for the recovery of his health. His great age, however, and the violence of his disease, having rendered every prescription ineffectual, his next care was to see him decently buried; and when he had paid the last duty to his remains, and erected a monument to his memory, he set out again for Italy. Other causes have been assigned for the death of Pherecydes: some say he was eaten up by lice, and others that he fell headlong from the top of Mount Corycius in his way to Delphos. He lived to the age of 85 years, and was one of the first prose writers among the Greeks.

"Marvellous circumstances have been related of him, which only deserve to be mentioned, in order to show that what has been deemed supernatural by ignorant spectators

Enfield's History of Philosophy.

spectators may be easily conceived to have happened from natural causes. A ship in full sail was at a distance approaching its harbour; Pherecydes predicted that it would never come into the haven, and it happened accordingly; for a storm arose which sunk the vessel. After drinking water from a well, he predicted an earthquake, which happened three days afterwards. It is easy to suppose that these predictions might have been the result of a careful observation of those phenomena which commonly precede storms or earthquakes in a climate where they frequently happen.

"It is difficult to give in any degree an accurate account of the doctrines of Pherecydes; both because he delivered them, after the manner of the times, under the concealment of symbols; and because very few memoirs of this philosopher remain. It is most probable that he taught those opinions concerning the gods and the origin of the world which the ancient Grecian theogonists borrowed from Egypt;" and of which the reader will find accounts in different articles of this work. See EGYPT, METAPHYSICS, MYSTERIES, MYTHOLOGY, and POLYTHEISM.

PHERETIMA, was the wife of Battus king of Cyrene, and the mother of Arcesilaus. After her son's death, she recovered the kingdom by means of Amasis king of Egypt, and to avenge the murder of Arcesilaus, she caused all his assassins to be crucified round the walls of Cyrene, and she cut off the breasts of their wives, and hung them up near the bodies of their husbands. It is said that she was devoured alive by worms; a punishment which, according to some of the ancients, was inflicted by Providence for her unparalleled cruelties.

PHIAL, a well-known vessel made of glass, used for various purposes.

Leyden PHIAL, is a phial of glass coated on both sides with tin-foil for a considerable way up the sides, of great use in electrical experiments. The discovery that electricity may be accumulated in an apparatus of this kind, was originally made in the year 1745 by Mr Von Kleist, dean of the cathedral in Comin. But this remarkable property was first satisfactorily observed at Leyden, with a bottle containing some water which served for the inside coating, and the accidental application of the hands on the outside served for another coating. Hence a bottle coated on both sides for the purpose of being charged with electricity, has received the name of *Leyden phial*, or otherwise *electric jar*. See ELECTRICITY, *passim*.

PHIDIAS, the most famous sculptor of antiquity, was an Athenian, and a contemporary of the celebrated Pericles, who flourished in the 83d Olympiad. This wonderful artist was not only consummate in the use of his tools, but accomplished in those sciences and branches of knowledge which belong to his profession, as history, poetry, fable, geometry, optics, &c. He first taught the Greeks to imitate nature perfectly in this way; and all his works were received with admiration. They were also incredibly numerous; for it was almost peculiar to Phidias, that he united the greatest facility with the greatest perfection. His Nemesis was ranked among his first pieces: it was carved out of a block of marble, which was found in the camp of the Persians after they were defeated in the plains of Marathon. He made an excellent statue of Minerva for the Plateans; but the statue of this goddess in her magnificent temple at Athens, of which there are still some ruined remains, was an astonishing production of human art. Pericles, who had the care of this pompous edifice, gave orders to Phidias, whose prodigious talents he well knew, to make a statue of the goddess; and Phidias formed a figure of ivory and gold 39 feet high. Writers never speak of this illustrious monument of skill without raptures; yet what has rendered the name of the artist immortal, proved at that time his ruin. He had carved upon the shield of the goddess his own portrait and that of Pericles; and this was, by those that envied them, made a crime in Phidias. He was also charged with embezzling part of the materials which were designed for the statue. Upon this he withdrew to Elis, and revenged himself upon the ungrateful Athenians, by making for the Elians the Olympic Jupiter: a prodigy of art, and which was afterwards ranked among the seven wonders of the world. It was of ivory and gold; 60 feet high, and every way proportioned. "The majesty of the work did equal the majesty of the god (says Quintilian), and its beauty seems to have added lustre to the religion of the country." Phidias concluded his labours with this masterpiece: and the Elians, to do honour to his memory, erected, and appropriated to his descendants, an office, which consisted in keeping clean this magnificent image.

PHIDITIA, in Grecian antiquity, feasts celebrated with great frugality at Sparta. They were held in the public places and in the open air. Rich and poor assisted at them equally, and on the same footing; their design being to keep up peace, friendship, good understanding, and equality among the citizens great and small. It is said that those who attended this feast brought each a bushel of flour, eight measures of wine named *chorus*, five pounds of cheese, and two pounds and a half of figs, with some money.

PHILA, in *Mythology*, one of the attributes of Venus, which distinguishes her as the mother of love, from φιλειν, *to love*.

PHILADELPHIA, in antiquity, were games instituted at Sardis to celebrate the union of Caracalla and Geta, the sons of Septimius Severus.

PHILADELPHIA, the capital of the state of Pensylvania in North America, situated in W. Long. 75. 8. N. Lat. 39. 57. It is one of the most beautiful and regular cities in the world, being of an oblong form, situated on the west bank of the river Delaware, on an extensive plain, about 118 miles (some say more) from the sea. The length of the city east and west, that is, from the Delaware to the Schuylkill, upon the original plan of Mr Penn, is about three miles, and the breadth, north and south, rather less than one mile. Not two fifths of the plot covered by the city charter is yet built. The inhabitants, however, have not confined themselves within the original limits of the city, but have built north and south along the Delaware two miles in length. The longest street is Second-street, about 700 feet from Delaware river, and parallel to it. The circumference of that part of the city which is built, if we include Kensington on the north and Southwark on the south, may be about five miles. Market-street is 100 feet wide, and runs the whole length of the city from river

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river to river. Near the middle, it is interſected at right angles by Broad-ſtreet, 113 feet wide, running nearly north and ſouth quite acroſs the city.

Between Delaware river and Broad-ſtreet are 14 ſtreets, nearly equidiſtant, running parallel with Broad-ſtreet acroſs the city; and between Broad-ſtreet and the Schuylkill, there are nine ſtreets equidiſtant from each other. Parallel to Market-ſtreet are eight other ſtreets, running eaſt and weſt from river to river, and interſecting the croſs ſtreets at right angles; all theſe ſtreets are 50 feet wide, except Arch-ſtreet, which is 65 feet wide. All the ſtreets which run north and ſouth, except Broad-ſtreet mentioned above, are 50 feet wide. There were four ſquares of eight acres each, one at each corner of the city, originally reſerved for public and common uſes. And in the centre of the city, where Broad-ſtreet and Market-ſtreet interſect each other, is a ſquare of ten acres, reſerved in like manner, to be planted with rows of trees for public walks. This city was founded in 1682 by the celebrated William Penn, who in October 1701 granted a charter incorporating the town with city privileges. In 1749 the dwelling-houſes were computed, and found to be 2076; in 1794, they amounted to 9000. They are in general handſomely built of brick; and contain 55,000 inhabitants, compoſed of almoſt all nations and religions. Their places for religious worſhip are as follows: The Friends or Quakers have five, the Preſbyterians ſix, the Epiſcopalians three, the German Lutherans two, the German Calviniſts one, the Catholics three, the Swediſh Lutherans one, the Moravians one, the Baptiſts one, the Univerſal Baptiſts one, the Methodiſts two, the Jews one.

The other public buildings in the city, beſides the univerſity, academies, &c. are the following, viz. a ſtate-houſe and offices, a city court-houſe, a county court-houſe, a carpenter's hall, a philoſophical ſociety's hall, a diſpenſary, an hoſpital and offices, an alms-houſe, a houſe of correction, a public factory of linen, cotton, and woollen, a public obſervatory, three brick market-houſes, a fiſh-market, a public gaol.

In Philadelphia there are 304 ſquares, and about 34 ſtreets, many of which are very broad, and all of them neat and elegant, lighted by 662 lamps of two branches each, and conſuming annually about 9000 gallons of oil. Here is a library which owed its origin to Dr Franklin, was incorporated in 1742, and now contains upwards of 12,000 volumes, beſides a muſeum and a valuable philoſophical apparatus. There is a new theatre in Cheſnut-ſtreet, which was finiſhed in 1793. The univerſity ſtands on the weſt ſide of Fourth-ſtreet, and was incorporated in the year 1791, the funds of which produce annually a revenue of about 2365l. and the ſtudents on an average amount to 510, of whom 25 are annually admitted to degrees. In the city and ſuburbs are 10 rope-walks, 13 breweries, 6 ſugar-houſes, 7 hair-powder manufactories, 2 rum-diſtilleries, 15 manufactories of earthen ware, and the public mint for the whole United States. In the year 1791, the value of the exports amounted to 3,436,092 dollars, and in 1795, to 11,518,260. From Auguſt 1792 to the ſame month in 1793, the births amounted to 2511, and the deaths to 1497, which added to the population rather more than a thouſand. There were 8060 debtors and criminals confined in the gaol from September 28th, 1780, to September 5. 1790, of which vaſt number only twelve died a natural death; than which nothing can be a more honourable proof of the great humanity with which priſoners are there treated.

The univerſity of Philadelphia was founded during the war. Its funds were partly given by the ſtate, and partly taken from the old college of Philadelphia. A medical ſchool, which was founded in 1765, is attached to the univerſity; and has profeſſors in all the branches of medicine, who prepare the ſtudents (whoſe number yearly is 50 or 60) for degrees in that ſcience. Beſides the univerſity and medical ſchool, there is the Proteſtant Epiſcopal academy, a very flouriſhing inſtitution; the academy for young ladies; another for the Friends or Quakers, and one for the Germans, beſides five free ſchools.

In Market-ſtreet, between Front and Fourth-ſtreets, is the principal market, built of brick, and is 1500 feet in length. This market, in reſpect to the quantity, the variety, and neatneſs of the proviſions, is not equalled in America, and perhaps not exceeded in the world.

The Philadelphians are not ſo ſocial, nor perhaps ſo hoſpitable, as the people in Boſton, Charleſtown, and New York. Various cauſes have contributed to this difference: among which the moſt operative has been the prevalence of party-ſpirit, which has been and is carried to greater lengths in this city than in any other in America; yet no city can boaſt of ſo many uſeful improvements in manufactures, in the mechanical arts, in the art of healing, and particularly in the ſcience of humanity. In ſhort, whether we conſider the convenient local ſituation, the ſize, the beauty, the variety and utility of the improvements, in mechanics, in agriculture, and manufactures, or the induſtry, the enterpriſe, the humanity, and the abilities, of the inhabitants of the city of Philadelphia, it merits to be viewed as the capital not only of the province, but of the flouriſhing empire of United America.

Several canals are let into the town, which add much to the beauty and convenience of the place. Its quay is 200 feet ſquare, to which ſhips of 400 or 500 tons may come up, and lay their broadſides cloſe to it; with wet and dry docks for building and repairing ſhips, beſides magazines, warehouſes, and all other conveniences for exporting and importing merchandize. Scarce any thing can appear more beautiful than the city and the adjacent country, which for ſome miles may be compared to a fine flouriſhing garden.

Though all our readers muſt unqueſtionably have heard of the malignant fever, known by the name of yellow fever, which ſome years raged in Philadelphia, it will not, we truſt, be thought improper if we give a ſhort account of that dreadful malady in this place. This account we ſhall extract from a pamphlet written by Mr Carey.

Of this fever, then, it is obſerved, that, generally ſpeaking, the mortality was not ſo great among women as among men, but that corpulent, high-fed, and drunken men, common proſtitutes, and ſuch of the poor as had been debilitated through the want of ſufficient nouriſhment, and lived in dirty and confined habitations, became an eaſy prey to it; whilſt thoſe who reſided in the ſuburbs, enjoying the benefit of country air, were little affected by it. A ſingular fact is, that the French

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French residing in Philadelphia were in a remarkable degree exempt from it; a circumstance which cannot be accounted for. The report which prevailed here of the Africans having wholly escaped the disease, proves to be not altogether true, several of them having been seized. The fever, however, was found to yield more readily to medicine in them than in white persons.

We find the following account of the nature and symptoms of the disease, as described by Dr Currie, in the third edition of the pamphlet already mentioned. "The symptoms which characterised the first stage of the fever were, in the greatest number of cases, after a chilly fit of some duration, a quick tense pulse; hot skin; pain in the head, back, and limbs; flushed countenance; inflamed eye; moist tongue; oppression and sense of soreness at the stomach, especially upon pressure; frequent sick qualms, and retchings to vomit, without discharging any thing, except the contents last taken into the stomach; costiveness, &c. And when stools were procured, the first generally showed a defect of bile, or an obstruction to its entrance into the intestines. But brisk purges generally altered this appearance.

"These symptoms generally continued with more or less violence from one to three, four, or even five days; and then gradually abating, left the patient free from every complaint, except general debility. On the febrile symptoms suddenly subsiding, they were immediately succeeded by a yellow tinge in the opaque cornea, or whites of the eyes; an increased oppression at the præcordia, a constant puking of every thing taken into the stomach, with much straining, accompanied with a hoarse hollow noise.

"If these symptoms were not soon relieved, a vomiting of matter resembling coffee-grounds in colour and consistence, commonly called the *black vomit*, sometimes accompanied with or succeeded by hemorrhagies from the nose, fauces, gums, and other parts of the body; a yellowish purple colour, and putrescent appearance of the whole body, hiccup, agitations, deep and distressed sighing, comatose delirium, and finally death, are the consequence. When the disease proved fatal, it was generally between the fifth and eighth days.

"This was the most usual progress of this formidable disease through its several stages. There were, however, very considerable variations in the symptoms as well as in the duration of its different stages, according to the constitution and temperament of the patient, the state of the weather, the manner of treatment, &c.

"In some cases, signs of putrescency appeared at the beginning or before the end of the third day. In these, the black vomiting, which was generally a mortal symptom, and universal yellowness, appeared early. In these cases, also, a low delirium, and great prostration of strength, were constant symptoms, and coma came on very speedily.

"In some, the symptoms inclined more to the nervous than the inflammatory type. In these, the jaundice colour of the eye and skin, and the black vomiting, were more rare. But in the majority of cases, particularly after the nights became sensibly cooler, all the symptoms indicated violent irritation and inflammatory diathesis. In these cases, the skin was always dry, and the remissions very obscure.

"The febrile symptoms, however, as has been already observed, either gave way on the third, fourth, or fifth day, and then the patient recovered; or they were soon after succeeded by a different but much more dangerous train of symptoms, by debility, low pulse, cold skin (which assumed a tawney colour, mixed with purple), black vomiting, hemorrhagies, hiccup, anxiety, restlessness, coma, &c. Many who survived the eighth day, though apparently out of danger, died suddenly in consequence of a hemorrhagy."

Purging the patient with calomel and jalap appears to have proved the most successful treatment; and the repeated use of the lancet, in cases where no symptoms of putridity existed. Dr Griffiths, who had been seized with the disease, "was bled seven times in five days, and ascribes his recovery principally to that operation." Dr Maese also, "in five days, lost 72 ounces of blood, by which he was recovered when at the lowest stage of the disorder." It was generally remarked that an obstinate costiveness took place at the commencement of the disease; and when this was removed, by purgatives, within the first twelve hours, the patient seldom failed to do well.

The work concludes with a list of the committee for the relief of the sick, of which our author was a member: also the names of a large number of the inhabitants who were cut off, a series of meteorological tables, and a general account of burials during the prevalence of this fatal complaint. From the latter we extract the following account:

"August	- -	325
"September	- -	1442
"October	- -	1993
"November	- -	118
"Jews, returned in gross	-	3
"Baptists,	do. - -	60
"Methodists,	do. -	32
"Free Quakers,	do. - -	39
"German part of St Mary's congregation		30
	Total	4042."

It is not difficult to conceive the general distress which such an evil must have occasioned to persons of every rank and description. Some of the most striking instances our author has related in very affecting terms; but no picture of human calamity perhaps ever exceeded the following: "A servant girl belonging to a family in this city, in which the fever had prevailed, was apprehensive of danger, and resolved to remove to a relation's house in the country. She was, however, taken sick on the road, and returned to town, where she could find no person to receive her. One of the guardians of the poor provided a cart, and took her to the alms-house, into which she was refused admittance. She was brought back, and the guardian offered five dollars to procure her a single night's lodging, but in vain. And in fine, after every effort made to provide her shelter, she absolutely expired in the cart."

We cannot dismiss the present article, though it has already extended to a sufficient length, without giving our readers an account of a very extraordinary people who live within 50 miles of Philadelphia; where there is a little town or colony, particularly remarkable on account of its origin and the manners of the people by whom it is inhabited. It was founded by a German,

who,

Philadelphia. who, weary of the world, returned into the country that he might be more at liberty to give himſelf up to contemplation. Curioſity brought ſeveral of his countrymen to viſit his retreat; and by degrees his pious, ſimple, and peaceable manners, induced them to ſettle near him; when they all formed a little colony, which they called *Euphrates*, in alluſion to the Hebrews, who uſed to ſing pſalms on the borders of that river.

This little town forms a triangle, the outſides of which are bordered with mulberry and apple trees planted with great regularity; and its inhabitants, we know not for what reaſon, are called *Dumplers*. In the middle of the town is a very large orchard, and between the orchard and thoſe ranges of trees are houſes built of wood, three ſtories high, where every Dumpler is left to enjoy the pleaſures of his meditation without diſturbance. Theſe contemplative men do not amount to above 500; and the extent of their territory is about 250 acres, bounded by a river, a piece of ſtagnated water, and a mountain covered with trees.

The men and women live in ſeparate quarters of the town, and never ſee each other but at places of worſhip; for among the Dumplers there are no aſſemblies of any kind but for public buſineſs. Their lives are ſpent in labour, prayer, and ſleep. Twice every day and night they are called forth from their cells to attend divine ſervice. Like the Methodiſts and Quakers, every individual among them has the right of preaching when he thinks himſelf inſpired. The favourite ſubjects on which they diſcourſe in their aſſemblies, are humility, temperance, chaſtity, and the other Chriſtian virtues. They never violate that day of repoſe which all orders of men, whether idle or luxurious, much delight in. They admit a hell and a paradiſe; but reject the eternity of future puniſhments. They abhor the doctrine of original ſin as an impious blaſphemy; and, in general, every tenet that is ſevere to men appears to them injurious to the Divinity. As they do not allow merit to any but voluntary works, they adminiſter baptiſm only to the adult; at the ſame time, they think baptiſm ſo eſſentially neceſſary to ſalvation, that they imagine the ſouls of Chriſtians in another world are employed in converting thoſe who have not died under the law of the Goſpel. In this ridiculous opinion we have known Chriſtians of other denominations, and who boaſted a higher antiquity, that agreed with them.

Still more diſintereſted than the Quakers, they never enter into any law-ſuit. One may cheat, rob, and abuſe them, without being expoſed to any retaliation, or even to any complaint from them. On them religion has the ſame effect that philoſophy had upon the Stoics: it makes them inſenſible to every kind of inſult.

Nothing can be plainer than their dreſs. In winter it is a long white gown, from which there hangs a hood, which ſerves inſtead of a hat, a coarſe ſhirt, thick ſhoes, and very wide breeches. The women are dreſſed very much like the men, except that they have no breeches. Their common food conſiſts wholly of vegetables; not becauſe it is unlawful to eat any other, but becauſe that kind of abſtinence is looked upon as more conformable to the ſpirit of Chriſtianity, which has an averſion from blood.

Each individual follows with cheerfulneſs the branch of buſineſs allotted him; and the produce of all their labours is depoſited in a common ſtock, for the uſe of the whole. This union of induſtry has not only eſtabliſhed agriculture, manufactures, and all the arts neceſſary for the ſupport of this little ſociety, but hath alſo ſupplied, for the purpoſes of exchange, ſuperfluities proportioned to the degree of its population.

Though the two ſexes live ſeparate at Euphrates, the Dumplers do not on that account fooliſhly renounce matrimony; but thoſe who find themſelves diſpoſed to it, leave the town, and form an eſtabliſhment in the country, which is ſupported at the public expence. They repay this by the produce of their labours, which is all thrown into the public treaſury; and their children are ſent to be educated in Euphrates, which they conſider as their mother-country.—Without this wiſe privilege, the Dumplers would be no better than monks; and in proceſs of time they would become either ſavages or libertines. They are at preſent an innocent, though perhaps deluded, race.

Philadelphia, an ancient town of Turkey in Aſia, in Natolia. It is ſeated at the foot of Mount Tmolus, by the river Cogamus, from whence there is an exceeding fine view over an extenſive plain. This place was founded by Attalus Philadelphus, brother of Eumenes.

It was very liable to earthquakes, which, perhaps, aroſe from its vicinity to the region called *Catakekaumene* *. So ſevere were thoſe earthquakes, that even the city walls were not ſecure; and ſo frequent were they that theſe experienced daily concuſſions. The inhabitants, therefore, who were not numerous, lived in perpetual apprehenſion, and their conſtant employment was in repairs. In fact, ſo great were their fears, that their chief reſidence was in the country, the ſoil of which was very fertile. Such is Strabo's account of this place. In the year 1097, it was taken by aſſault by John Ducas the Greek general. It was without difficulty reduced alſo in the year 1106, under the ſame emperor. The Turks marched from the Eaſt with a deſign to plunder it and the maritime towns. The emperor Manuel, in 1175, retired for protection from the Turks to this place. In 1300, it fell by lot to Karaman. In 1306, it was beſieged by Aliſaras, and conſiderably haraſſed; but was not taken. In 1391, this place alone refuſed to admit Bajazet; but it was at length forced to capitulate for want of proviſions. It has been matter of ſurpriſe that this town was not totally abandoned; and yet it has ſurvived many cities leſs liable to inconveniences, and is ſtill an extenſive place, though in its appearance it is poor and mean. Some remnants of its walls are ſtill ſtanding, but with large gaps. The materials of the wall are ſmall ſtones ſtrongly cemented. It is thick, lofty, and has round towers. Near this place, between the mountains, there is a ſpring of a purgative quality; it is much eſteemed, and many people reſort to it in the hot months. It taſtes like ink, is clear, but tinges the earth with the colour of ochre. The famous wall, which credulity has aſſerted to be made of human bones, ſtands beyond this and beyond the town. See the next article.

* Signifying *the Burned.*

When Dr Chandler was there, he tells us, "The biſhop of Philadelphia was abſent; but the proto-papas or chief prieſt, his ſubſtitute, whom we went to viſit, received us at his palace, a title given to a very indifferent houſe or rather a cottage of clay. We found him ignorant

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ignorant of the Greek tongue, and were forced to diſcourſe with him by an interpreter in the Turkiſh language. He had no idea that Philadelphia exiſted before Chriſtianity, but told us it had become a city in conſequence of the many religious foundations. The number of churches he reckoned at 24, moſtly in ruins, and mere maſſes of wall decorated with painted ſaints. Only ſix are in a better condition, and have their prieſts. The epiſcopal church is large, and ornamented with gilding, carving, and holy portraits. The Greeks are about 300 families, and live in a friendly intercourſe with the Turks, of whom they ſpeak well. We were aſſured that the clergy and laity in general knew as little of Greek as the proto-papas; and yet the liturgies and offices of the church are read as elſewhere, and have undergone no alteration on that account.

"The Philadelphians are a civil people. One of the Greeks ſent us a ſmall earthen veſſel full of choice wine. Some families beneath the trees, by a rill of water, invited us to alight, and partake of their refreſhments. They ſaluted us when we met; and the aga or governor, on hearing that we were Franks, bade us welcome by a meſſenger.

"Philadelphia poſſeſſing waters excellent in dyeing, and being ſituated on one of the moſt capital roads to Smyrna, is much frequented, eſpecially by Armenian merchants. The Greeks ſtill call this place by its ancient name, but the Turks call it *Allahijur*. The number of inhabitants is about 7000 or 8000; of whom 2000 are ſuppoſed to be Chriſtians. It is about 40 miles E. S. E. of Smyrna. E. Long. 28. 15. N. Lat. 38. 28.

PHILADELPHIA-Stones, a name which ſome authors have given to what is otherwiſe called *Chriſtian bones*, found in the walls of that city. It is a vulgar error that theſe walls are built of bones; and the tradition of the country is, that when the Turks took the place, they fortified it for themſelves, and built their walls of the bones of the Chriſtians whom they had killed there. Dr Smyth in one of his epiſtles, mentions this wall as an inſtance of Turkiſh barbarity. This idle opinion has gained credit merely from a looſe and porous ſtone of the ſparry kind, found in an old aqueduct, which is ſtill in the wall. Sir Paul Rycaut brought home pieces of theſe ſtones, which even he ſuppoſed to have been bones, but they proved on examination to be various bodies, chiefly vegetable, incruſted over and preſerved in a ſpar of the nature of that which forms incruſtations in Knareſborough ſpring, and other places with us. Theſe bodies are often cemented together in conſiderable numbers by this matter, and their true ſhape loſt in the congeries, till a diligent and judicious eye traces them regularly.

PHILADELPHIAN Society, in eccleſiaſtical hiſtory, an obſcure and inconſiderable ſociety of myſtics. They were formed about the end of the laſt century by an Engliſh female fanatic, whoſe name was *Jane Leadley*. This woman, ſeduced by her viſions, predictions, and doctrines, ſeveral diſciples, among whom were perſons of learning. She believed that all diſſenſions among Chriſtians would ceaſe, and the kingdom of the Redeemer become a ſcene of charity and felicity, if Chriſtians, diſregarding the forms of doctrine or diſcipline of their ſeveral communions, would all join in committing their ſouls to the care of the internal guide, to be inſtructed, governed, and formed, by his divine impulſe and ſuggeſtions. But ſhe went farther than this: ſhe even pretended a divine commiſſion to proclaim the approach of this glorious communion of ſaints; and was convinced that the ſociety eſtabliſhed by herſelf was the true kingdom of Chriſt. One of her leading doctrines was, that of the final reſtoration of all intelligent beings to perfection and happineſs.

PHILADELPHUS, in antiquity, was a title or ſurname borne by ſeveral ancient kings; formed from the Greek φιλος, "friend, lover," and αδελφος, "brother;" q. d. one who loves his brother or brethren. See PTOLEMY and EGYPT.

PHILADELPHUS, the PIPE-TREE, or *Mock-orange*; a genus of plants belonging to the icoſandria claſs. See BOTANY *Index*.

The coronarius, white ſyringa, or mock-orange, has been long cultivated in the gardens of this country as a flowering ſhrub; it is not well known in what country it is to be found native. It riſes ſeven or eight feet high; ſending up a great number of ſlender ſtalks from the root. Theſe have a grey bark, branch out from their ſides, and are garniſhed with oval ſpear-ſhaped leaves. This ſhrub by its flowers makes a fine figure in May and June; for they are produced in cluſters both at the end and from the ſides of the branches. They are of a fine white colour, and exceedingly fragrant.

PHILÆNI, were two brothers, citizens of Carthage, who ſacrificed their lives for the good of their country. At the time when the Carthaginians ruled over the greateſt part of Africa, the Cyrenians were alſo a great and wealthy people. The country in the middle betwixt them was all ſandy, and of an uniform appearance. There was neither river nor mountain to diſtinguiſh their limits; a circumſtance which engaged them in a terrible and tedious war with one another. After their armies and fleets had been often routed and put to flight on both ſides, and they had weakened one another pretty much; and fearing leſt, by and by, ſome third people ſhould fall upon the conquered and conquerors together, equally weakened, upon a ceſſation of arms they made an agreement, "that upon a day appointed deputies ſhould ſet out from their reſpective homes, and the place where they met one another ſhould be accounted the common boundary of both nations." Accordingly, the two brothers called Philæni, ſent from Carthage, made all diſpatch to perform their journey. The Cyrenians proceeded more ſlowly. Theſe laſt, perceiving themſelves a little behind, and becoming apprehenſive of puniſhment at home for miſmanaging the affair, charged the Carthaginians with ſetting out before the time; made a mighty buſtle upon it; and, in ſhort, would rather chooſe any thing than go away outdone. But whereas the Carthaginians deſired any other terms, provided only they were fair, the Cyrenians made this propoſal to the Carthaginians, "either to be buried alive in the place which they claimed as the boundary to their nation, or that they would advance forward to what place they inclined upon the ſame condition." The Philæni accepting the offer, made a ſacrifice of themſelves and their lives to their country, and ſo were buried alive. The Carthaginians dedicated altars in that place to the memory of the two brothers. Theſe altars, called *Aræ Philænorum*, ſerved as a boundary to the em-

pire of the Carthaginians, which extended from this monument to Hercules's Pillars, which is about 2000 miles, or, according to the accurate obſervations of the moderns, only 1420 geographical miles. It is Salluſt who gives this account in his hiſtory of the Jugurthine war.

PHILANTHROPY is compounded of two Greek words which ſignify the love of mankind. It is therefore of nearly the ſame import with *benevolence* (A); and differs from *friendſhip*, as this latter affection ſubſiſts only between a few individuals, whilſt *philanthropy* comprehends the whole ſpecies.

Whether man has an inſtinctive propenſity to love his ſpecies, which makes him incapable of happineſs but in the midſt of ſociety, and impels him to do all the good that he can to others, feeling their felicity an addition to his own, is a queſtion that has been warmly debated among philoſophers ever ſince metaphyſics was ſtudied as a ſcience. With the opinions of the ancients we ſhall not, in this detached article, trouble our readers; but it would be unpardonable to paſs without notice the different theories which on ſo intereſting a ſubject have divided the moderns.

Hobbes, who believed, or pretended to believe, that right reſults from power, and that in ſociety there is no other ſtandard of juſtice than the law of the land, or the will of the ſupreme magiſtrate, built his opinions upon a theory of human nature, in which philanthropy has no place. According to him, mankind, in the original ſtate of nature, were wholly *ſelfiſh*. Each endeavoured to ſeize, by fraud or force, whatever he thought would contribute to his comfort; and as all had nearly the ſame wants, the inevitable conſequence of this ſelfiſhneſs was univerſal war. We are taught indeed by the ſame philoſopher, that, in a ſeries of ages, mankind diſcovered the miſeries of this ſtate of nature; and therefore, upon the ſame baſis of univerſal ſelfiſhneſs, formed ſocieties, over which they placed ſupreme governors for the purpoſe of protecting the weak againſt the violence of the ſtrong. He does not, however, explain how men, whoſe angry and ſelfiſh paſſions were thus excited to the utmoſt againſt each other, could enter upon this friendly treaty; or, ſuppoſing it formed, how the ignorant multitude were induced to pay obedience to the more enlightened few. Clogged with this and other inſurmountable difficulties, his philoſophy of human nature ſoon fell into merited contempt; but about the *origin* of philanthropy thoſe who united in oppoſition to him ſtill thought very differently from one another.

The elegant Shafteſbury, who had imbibed much of the ſpirit of Plato, endeavoured, like his maſter, to deduce all the duties of man, and almoſt all his actions, from a number of internal feelings or inſtincts which he ſuppoſed to be interwoven with his conſtitution by the immediate hand of God. This ſyſtem appeared ſo honourable to human nature, and at the ſame time was ſo eaſily comprehended, that the noble lord had ſoon many followers, and may indeed be conſidered as the founder of a ſchool which has produced philoſophers whoſe works do honour to the age and country in which they flouriſhed. Among theſe we muſt reckon Biſhop Butler, Hutchiſon, Lord Kames, Dr Beattie, and perhaps Dr Reid.

According to the ſyſtem of theſe writers, the whole duty of man reſults from an intuitive principle, to which they have given the name of the moral ſenſe; and with this ſenſe they conceive philanthropy to be inſeparably united, or rather perhaps to make an eſſential part of it. (See MORAL PHILOSOPHY). If this theory be carried to its utmoſt extent, as it has been by ſome of its patrons, it ſeems to follow, that peace and harmony ſhould reign among ſavages; and that a man who had from his infancy grown up in ſolitude, would be delighted with the firſt ſight of a fellow-creature, and run to him with eagerneſs as to a new ſource of enjoyment. This concluſion, however, is contrary to acknowledged facts. Savages are generally divided into ſmall tribes or hordes; and though the attachment of individuals to their own tribe appears indeed to be abundantly ſtrong, the tribes themſelves are frequently at war, and entertain a conſtant jealouſy of each other. Savages, too, are almoſt univerſally afraid of ſtrangers; and the few ſolitary individuals, who have been caught in parts where they had run wild from their infancy, inſtead of being delighted with the appearance of fellow-men, have either fled from them with their utmoſt ſpeed, or been fixed to the ſpot in terror and aſtoniſhment. Theſe are no indications of that inſtinctive philanthropy for which ſome writers ſo ſtrenuouſly plead. They have indeed induced others to deny, that in human nature there is any inſtinctive principles at all; and to endeavour to account for our ſeveral propenſities by the influence of education producing early and deep-rooted habits.

At the head of this ſchool ſtood Locke and Hartley. The former, employing himſelf almoſt wholly on the intellectual powers of man, and combating the abſurd, though then generally received, belief, that there are in the human mind innate principles of ſpeculative truth, has touched but incidentally on our principles of action. It ſeems, however, to be evident, that he did not conſider any *one* of theſe principles as innate; and his opinion was adopted by Hartley, who ſtudied the ſenſitive part of human nature with greater induſtry and ſucceſs than perhaps any writer who had preceded him in that department of ſcience. This philoſopher refuſes all kinds of inſtinct to man, even the στοργη of a mother to her new-born infant, and that which has been generally ſuppoſed innate—the propenſity of the infant to ſuck the breaſt. It is therefore needleſs to ſay that in his theory of human nature innate philanthropy can have no place.

The reader, however, muſt not ſuppoſe that the theory of Hartley is the theory of Hobbes. Though he admits no *innate* principles of action in the human mind, he is far from dreaming that the original ſtate of man was a ſtate of war and ſelfiſhneſs, or that the acquiſition of philanthropic ſentiments is not natural. He conſiders ſuch

(A) We ſay *nearly* of the ſame import; becauſe *benevolence* extends to every being that has life and ſenſe, and is of courſe ſuſceptible of pain and pleaſure; whereas *philanthropy* cannot comprehend more than the human race.

fuch acquifitions as even neceffary and unavoidable, and founds them on the great law of affociation, which we have elfewhere endeavoured to explain. (See METAPHYSICS, Part I. chap. v.). Hartley was a Chriftian, and appears to have been a man of great piety. Conceiving with Locke that men are born without any ideas, or any principles either of knowledge or of action, but that they are fubject to the law of affociation as much as to the impreffions of fenfe, he feems to have thought, that the important purpofe for which they are fent into this world is, that they may acquire habits of piety and virtue, which, operating like inftincts, will fit them for the purer fociety of a future ftate. That this theory is unfriendly to morals, no man who underftands it will prefume to affirm. It appears, indeed, to be more confiftent with the neceffity of a revelation from God than that of Shaftefbury, which has fo many followers: but notwithftanding this, we cannot help thinking that the excellent author has carried his antipathy to inftincts by much too far (fee INSTINCT), and that the truth lies in the middle between him and his opponents.

Without fome inftincts to influence before the dawn of reafon, it is not eafy to be conceived how children could be induced to that exercife which is abfolutely neceffary to life and health; nor does it appear with fufficient evidence that the human race are deferted by every inftinct as foon as their rational powers are evolved. It feems to be a matter of fact which cannot be contraverted, that women have an inftinctive attachment to their new-born infants; but that thefe, when they become capable of diftinguifhing objects, are *inftinctively* attached to their parents, their brothers, and fifters, is a pofition which, though it may be true, feems incapable of proof. That they foon appear to be fo attached, is a fact which we believe no man will deny; but the attachment may be accounted for by the affociating principle operating upon that defire of happinefs which is neceffarily formed as foon as happinefs is experienced. (See PASSION). An infant becomes earlier attached to its nurfe than to any other perfon; becaufe, feeling wants which fhe fupplies, the idea of enjoyment becomes foon affociated in its mind with the perception of the woman. If this woman be its mother, a hafty obferver immediately attributes this attachment to inftinct directing the infant to love its parent; but that inftinct has here no place, is evident from the well-known facts, that a child is as fond of a tender nurfe, though no relation, as of the moft affectionate mother; and as regardlefs of a mother who feldom fees it, or fees it with indifference, as of any other perfon. Nay, we have feen children of the fweeteft difpofitions as fond of the maid with whom they flept, as of a very affectionate parent by whom they had been tenderly nurfed: and fure no man will fay that this could be inftinct; it was evidently a new affociation of the idea of the maid with the greateft happinefs which they enjoyed after the period of their fuckling was at an end.

It is much in the fame way that children acquire an attachment to their brothers and fifters. Brothers and fifters being conftantly together, contribute to each other's amufement: hence arifes that pleafure which they have in each other's company, and the uneafinefs which they feel when feparated. This generates mutual love in their minds, which is ftrengthened by the perpetual injunctions of their parents; for if thefe have any virtue themfelves, they cannot fail to inculcate the duty of loving each other on their tender offspring. Benevolence, thus generated, foon extends to their daily companions; and takes a wider and a wider range as thefe companions are multiplied, and as children advance towards the ftate of manhood. New objects then prefent themfelves to the mind. A man foon difcovers, that, as he is a member of a community, his happinefs as an individual depends in a great meafure on the profperity of the whole. Hence arifes *patriotifm*, and that pleafure which we all take in the eminence of our countrymen. But the principle of benevolence ftops not here. He whofe mind is enlarged by a liberal education, confiders all particular countries as provinces of one great country extended over the whole globe; and all mankind, of courfe, as not only fharing the fame nature with himfelf, but as being in reality his fellow-citizens and brethren. The principles of religion, if he be actuated by them, muft aid thefe reflections, and make him wifh the happinefs of all who ftand in the fame relation with himfelf to the Great Governor of the world. This is *philanthropy*; and we fee how it may fpring, by the great law of affociation, from defires which, in their original ftate, cannot be confidered as other than felfifh. It is a calm fentiment, which we believe hardly ever rifes to the warmth of affection, and certainly not to the heat of paffion.

Should any of our readers be difpofed to controvert this opinion, or to fancy it degrading to human nature, we will not enter into controverfy with them; we only beg leave to afk, whether they have ever rejoiced in the good fortune of a ftranger or a foreigner, or regretted his lofs, with any portion of thofe feelings which they have frequently experienced on hearing of the profperity or the death of a friend or a neighbour? We anfwer candidly for ourfelves, that we feel no intereft which can be called *paffion* or *affection* in the fortunes of a native of China; and yet we fhould be forry to think that our philanthropy is lefs than that of other men. A common clown, we are inclined to believe, feldom extends his affection beyond his friends and neighbours; and though, from having often heard his country praifed, and knowing that he belongs to his country, he would probably be offended at the man who fhould prefer another to it; yet if no misfortune befal him, or his friends and neighbours, we imagine that his grief for public calamities may be borne with patience. In his mind no fuch affociations have been formed as comprife the good of a country, far lefs of all countries; and therefore his philanthropy muft be confined to a very limited range. We doubt not, however, but that as opportunity offers, and as circumftances permit, fuch a man is ready to feed the hungry and clothe the naked of all countries; not indeed from fentiments of affection either innate or acquired, but from the obvious reflection that he is not exempted from thofe calamities which have befallen them, and from a ftill higher principle—a fenfe of duty to that God who has made of one blood all nations upon earth, and commanded them to be mutually aiding to each other.

PHILEMON, a Greek comic poet, was fon to Damon, and cotemporary with Menander. Any advantage he had over this poet, was owing lefs to his own merit than to the intrigues of his friends. Plautus has imitated his comedy *du Marchand*. He is reported to have died laughing on feeing his afs eat figs. He was then about

Philemon || Philetus.

about 97 years of age. His son Philemon the younger, was alſo the author of 54 comedies, of which there are ſtill extant ſome conſiderable fragments collected by Grotius. Theſe clearly prove that he was not a poet of the firſt rank. He flouriſhed about the year 274 before our Saviour.

PHILEMON, was a rich citizen of Coloſſæ in Phrygia. He was converted to the Chriſtian faith, with Appia his wife, by Epaphras the diſciple of St Paul; for St Paul himſelf did not preach at Coloſſæ, Coloſſ. ii. 1. Perhaps we ſhould have known nothing of St Philemon, had it not been on the account of his ſlave Oneſimus, who having robbed him, and run away from him, came to Rome, where he found St Paul, and was very ſerviceable to him. St Paul converted him, baptized him, and ſent him back to his maſter Philemon; to whom he wrote a letter ſtill extant, and which paſſes for a maſterpiece of that kind of eloquence, natural, lively, ſtrong, and pathetic, that was peculiar to St Paul. Philemon (1. 2.) had made a church of his houſe, and all his domeſtics, as well as himſelf, were of the houſehold of faith. His charity, liberality, and compaſſion, were a ſure refuge to all that were in diſtreſs. The Apoſtolical Conſtitutions ſay, that St Paul made him biſhop of Coloſſæ; but the Menæa inſinuate, that he went to Gaza in Paleſtine, of which he was the apoſtle and firſt biſhop. From hence he returned to Coloſſæ, where he ſuffered martyrdom with Appia his wife, in the time of Nero. They relate ſeveral particulars of his martyrdom, and ſay, that his body remained at Coloſſæ, where it performed ſeveral miracles.

PHILETAS, a Greek poet and grammarian, of the iſland of Cos, flouriſhed under Philip and Alexander the Great, and was preceptor of Ptolemy Philadelphus. He was the author of ſome Elegies, Epigrams, and other works, which have not come down to us. He is celebrated in the poems of Ovid and Propertius, as one of the beſt poets of his age. Elian reports a very improbable ſtory of him, namely, "that his body was ſo ſlender and feeble, that he was obliged to have ſome lead in his pockets, to prevent him from being carried away by the wind."

PHILETUS. St Paul, writing to Timothy (2 Tim. ii. 16, 17, 18.) in the 65th year of Chriſt, and a little while before his own martyrdom, ſpeaks thus: "But ſhun profane and vain babblings, for they will increaſe unto more ungodlineſs. And their word will eat as doth a canker; of whom is Hymenæus and Philetus; who concerning the truth have erred, ſaying, that the reſurrection is paſt already, and overthrow the faith of ſome." We have nothing very certain concerning Philetus; for we make but ſmall account of what is read in the falſe Abdias, in the life of St James major, even ſuppoſing this author had not put the name of Philetus inſtead of Phygellus. This is the ſubſtance of what is found in Abdias. St James the ſon of Zebedee, paſſing through the ſynagogues of Judea and Samaria, preached everywhere the faith of Jeſus Chriſt. Hermogenes and Philetus ſtrenuouſly oppoſed him, affirming, that Jeſus Chriſt was not the Meſſiah. Hermogenes was a notable magician, and Philetus was his diſciple, who being converted, was deſirous to bring his maſter to St James; but Hermogenes bound him up ſo by his magic art, that he could not come at the apoſtle. Philetus found means to make St James acquainted with what had happened to him; upon which St James unbound him, and Philetus came to him. Hermogenes perceiving how ineffectual his art was againſt the ſaint, became himſelf a convert as well as Philetus.

Philetus || Philip.

PHILIBEG, is a little plaid, called alſo *kilt*, and is a ſort of ſhort petticoat reaching nearly to the knees, worn by the Scotch Highlanders. It is a modern ſubſtitute for the lower part of the plaid, being found to be leſs cumberſome, eſpecially in time of action, when the Highlanders uſed to tuck their brechdan into their girdle. Almoſt all of them have a great pouch of badger and other ſkins, with taſſels dangling before, in which they keep their tobacco and money.

PHILIP, foſter-brother of Antiochus Epiphanes (1 Macc. vi. 14, & 55. 2 Macc. ix. 29.), was a Phrygian by birth, and very much in Antiochus's favour. This prince made him governor of Jeruſalem (2 Macc. viii. 8. v. 22.) where he committed many outrages upon the Jews, to force them to forſake their religion. Seeing that Apollonius and Seron were defeated by Judas Maccabæus, he ſent for new ſuccours to Ptolemy governor of Cœlo-Syria, who ſent him Gorgias and Nicanor with a powerful army. Some time after, Antiochus going beyond the Euphrates, to extort money from the people, Philip went along with him; and Antiochus finding himſelf near his end (1 Macc. vi. 14.) made him regent of the kingdom, put his diadem into his hands, his royal cloak, and his ring, that he might render them to his ſon the young Antiochus Eupator. But Lyſias having taken poſſeſſion of the government in the name of young Eupator, who was but a child, Philip not being able to cope with him, durſt not return into Syria: but he went into Egypt, carrying the body of Epiphanes along with him, there to implore aſſiſtance from Ptolemy Philometor againſt Lyſias the uſurper of the government of Syria. The year following, while Lyſias was buſy in the war carrying on againſt the Jews, Philip got into Syria, and took poſſeſſion of Antioch: but Lyſias returning into the country, with great diligence, retook Antioch, and put Philip to death, who was taken in the city.

PHILIP the apoſtle was a native of Bethſaida in Galilee. Jeſus Chriſt having ſeen him, ſaid to him, "Follow me," John i. 43, 44, &c. Philip followed him; and ſoon after finding Nathanael, Philip ſaid to him, "We have found the Meſſiah, of whom Moſes and the prophets have ſpoken, Jeſus of Nazareth, the ſon of Joſeph." Nathanael aſked him, "Can any thing good come out of Nazareth?" To which Philip replied, "Come and ſee." Then he brought Nathanael to Jeſus, and they went with him to the marriage of Cana in Galilee. St Philip was called at the very beginning of our Saviour's miſſion; and when Jeſus Chriſt was about to feed the 5000 that followed him (Luke vi. 13. Mat. x. 2. John vi. 5—7.), he aſked St Philip, only to prove him, whence bread might be bought for ſuch a multitude of people? Philip anſwered, that 200 pennyworth of bread would not be ſufficient for every one to taſte a little. Some Gentiles, having a curioſity to ſee Jeſus Chriſt, a little before his paſſion, they addreſſed themſelves to St Philip (John xii. 21, 22.), who mentioned it to St Andrew, and theſe two to Chriſt. At the laſt ſupper, Philip deſired our Saviour, that he would be pleaſed to ſhow them the Father, being all that they deſired (John xiv. 8—10.) But Jeſus told them, that ſeeing the Son they ſaw the

Father alſo. This is all we find concerning Philip in the goſpel.

The upper Aſia fell to this apoſtle's lot, where he took great pains in planting the goſpel, and by his preaching and miracles made many converts. In the latter part of his life, he came to Hierapolis in Phrygia, a city very much addicted to idolatry, and particularly to the worſhip of a ſerpent of a prodigious bigneſs. St Philip by his prayers procured the death, or at leaſt the diſappearing, of this monſter, and convinced its worſhippers of the abſurdity of paying divine honours to ſuch odious creatures. But the magiſtrates, enraged at Philip's ſucceſs, impriſoned him, and ordered him to be ſeverely ſcourged, and then put to death, which ſome ſay was by crucifixion; others, by hanging him up againſt a pillar. St Philip is generally reckoned among the married apoſtles; and it is ſaid he had three daughters, two whereof preſerved their virginity, and died at Hierapolis; the third, having led a very ſpiritual life, died at Epheſus. He left behind him no writings. The goſpel under his name was forged by the Gnoſtics, to countenance their bad principles and worſe practices. The Chriſtian church obſerves the feſtival of this ſaint, together with that of St James, on the firſt day of May. Euſeb. lib. iii. c. 30.

Philip, the ſecond of the ſeven deacons, was choſen by the apoſtles after our Saviour's reſurrection. (Acts vi. 5.). This deacon, they ſay, was of Cæſarea in Paleſtine. It is certain that his daughters lived in this city (Acts xxi. 8, 9.). After the death of St Stephen, all the Chriſtians, excepting the apoſtles, having left Jeruſalem, and being diſperſed in ſeveral places, St Philip went to preach at Samaria (*id.* viii. 1, 2, &c.), where he performed ſeveral miracles, and converted many perſons. He baptized them; but being only a deacon, he could not confer on them the Holy Ghoſt. Wherefore having made known to the apoſtles at Jeruſalem, that Samaria had received the word of God, Peter and John came thither, and the Samaritans that were converted received the Holy Ghoſt. St Philip was probably at Samaria when the angel of the Lord ordered him to go to the ſouth part of the country, in the road that leads from Jeruſalem to old Gaza. Philip obeyed, and there met with an Ethiopian eunuch belonging to Queen Candace, who had the care of her revenues, and had been at Jeruſalem to worſhip God there (*id.* viii. 26, 27, &c.). He was then returning into his own country, and was reading the prophet Iſaiah as he went along in his chariot. Philip, hearing the eunuch reading the prophet Iſaiah, ſaid to him, Do you underſtand what you read? The eunuch replied, How ſhould I underſtand, except ſomebody explain it to me? He deſired Philip therefore to come and ſit down by him in the chariot. The paſſage the eunuch was reading is this: "He was led as a ſheep to the ſlaughter, and like a lamb dumb before his ſhearer, ſo he opened not his mouth." The eunuch then ſays to Philip, Pray, whom does the prophet ſpeak of in this place? Is it of himſelf, or of ſome other? Then Philip began to inſtruct him concerning Jeſus Chriſt. And having gone on together, they came to a fountain; when the eunuch ſaid to Philip, Here is water, what hinders me from being baptized? Philip told him that he might be ſo, if he believed with all his heart. He replied, I believe that Jeſus Chriſt is the ſon of God. He then ordered the chariot to ſtop, and they both alighted and went down into the water, where Philip baptized the eunuch. Being come out of the water, the Spirit of the Lord took away Philip, and the eunuch ſaw no more of him. But Philip was found again at Azotus, and he preached the goſpel in all the cities he paſſed through, till he arrived at Cæſarea in Paleſtine. After this, the ſcripture does not inform us of any particulars relating to Philip. The modern Greeks ſay that he went to Tralles in Aſia, where he founded a church, of which he was the apoſtle and biſhop; and where he reſted in peace, after performing many miracles. The Latins, on the contrary, ſay that he died at Cæſarea, and that three of his daughters were there buried with him.

It is thought, that the eunuch converted by St Philip was the firſt apoſtle of the Ethiopians; and that the Abyſſines boaſt of having received the Chriſtian faith from him.

Philip II. was the fourth ſon of Amyntas, king of Macedonia. He was ſent to Thebes as an hoſtage by his father, where he learnt the art of war under Epaminondas, and ſtudied with the greateſt care the manners and the purſuits of the Greeks. He diſcovered, from his earlieſt years, that quickneſs of genius and greatneſs of courage which afterwards procured him ſo great a name and ſuch powerful enemies. He was recalled to Macedonia; and at the death of his brother Perdiccas he aſcended the throne as guardian and protector of the youthful years of his nephew. His ambition, however, ſoon diſcovered itſelf, and he made himſelf independent about the year 360 before Chriſt. The valour of a prudent general, and the policy of an experienced ſtateſman, ſeemed requiſite to enſure his power. The neighbouring nations, ridiculing the youth and inexperience of the new king of Macedonia, appeared in arms; but Philip ſoon convinced them of their error. Unable to meet them as yet in the field of battle, he ſuſpended their fury by preſents, and ſoon turned his arms againſt Amphipolis, a colony tributary to the Athenians. Amphipolis was conquered, and added to the kingdom of Macedonia; and Philip meditated no leſs than the deſtruction of a republic which had rendered itſelf ſo formidable to the reſt of Greece, and had even claimed ſubmiſſion from the princes of Macedonia. His deſigns, however, were as yet immature; and before he could make Athens an object of conqueſt, the Thracians and the Illyrians demanded his attention. He made himſelf maſter of a Thracian colony, to which he gave the name of *Philippi*, and from which he received the greateſt advantages on account of the gold mines in the neighbourhood. Theſe made it a very important capture. He ſettled in it a number of workmen, and was the firſt who cauſed gold to be coined in his own name. He employed his wealth in procuring ſpies and partiſans in all the great cities of Greece, and in making conqueſts without the aid of arms. It was at the ſiege of Methone in Thrace that Philip had the misfortune to receive a wound in his right eye from the ſtroke of an arrow. In the midſt of his political proſperity, Philip did not neglect the honour of his family. He married Olympias the daughter of Neoptolemus, king of the Moloſſi; and when, ſome time after, he became father of Alexander, the monarch, conſcious of the ineſtimable advantages which ariſe from the leſſons, the example, and converſation of a learned and virtuous preceptor, wrote a letter with his own hand to the philoſopher Ariſtotle, and

Lempriere's Bibliotheca Classica.

Philip. begged him to retire from his usual pursuits, and to dedicate his whole time to the instruction of the young prince. Every thing seemed now to conspire to his aggrandizement; and historians have observed that Philip received in one day the intelligence of three things which could gratify the most unbounded ambition, and flatter the hopes of the most aspiring monarch: the birth of a son, an honourable crown at the Olympic games, and a victory over the barbarians of Illyricum. But all these rather increased than satiated his ambition: he declared his inimical sentiments against the power of Athens, and the independence of all Greece, by laying siege to Olynthus, a place which, on account of its situation and consequence, would prove most injurious to the interests of the Athenians, and most advantageous to the intrigues and military operations of every Macedonian prince. The Athenians roused by the eloquence of Demosthenes, sent 17 vessels and 2000 men to the assistance of Olynthus; but the money of Philip prevailed over all their efforts. The greatest part of the citizens suffered themselves to be bribed by the Macedonian gold, and Olynthus surrendered to the enemy, and was instantly reduced to ruins. Philip, soon after defeated the Athenians, and made a great number of them prisoners, whom he dismissed without ransom. Of this victory, the fruit of that excellent discipline which he had established in his army, the Macedonian phalanx had the principal honour. This was a body of infantry heavily armed, consisting commonly of 16,000 men, who had each of them a shield six feet high and a pike 21 feet long. (See PHALANX). The success of his arms, and especially his generosity after victory, made his alliance and a peace a desirable object to the people of Athens; and as both parties were inclined to this measure, it was concluded without delay. His successes were as great in every part of Greece: he was declared head of the Amphictyonic council, and was entrusted with the care of the sacred temple of Apollo at Delphi. If he was recalled to Macedonia, it was only to add fresh laurels to his crown, by victories over his enemies in Illyricum and Thessaly. By assuming the mask of a moderator and peace-maker, he gained confidence; and in attempting to protect the Peloponnesians against the incroaching power of Sparta, he rendered his cause popular; and by ridiculing the insults that were offered to his person as he passed through Corinth, he displayed to the world his moderation and philosophic virtues. In his attempts to make himself master of Euboea, Philip was unsuccessful; and Phocion, who despised his gold as well as his meanness, obliged him to evacuate an island whose inhabitants were as insensible to the charms of money as they were unmoved at the horrors of war, and the bold efforts of a vigilant enemy. From Euboea he turned his arms against the Scythians; but the advantages he obtained over this indigent nation were inconsiderable, and he again made Greece an object of plunder and rapine. He advanced far in Boeotia, and a general engagement was fought at Chaeronea. The fight was long and bloody, but Philip obtained the victory. His behaviour after the battle reflects great disgrace upon him as a man and as a monarch. In the hour of festivity, and during the entertainment which he had given to celebrate the trophies he had won, Philip sallied from his camp, and with the inhumanity of a brute, he insulted the bodies of the slain, and exulted over the calamities of the prisoners of war. His insolence, however, was checked, when Demades, one of the Athenian captives, reminded him of his meanness, by exclaiming, "Why do you, O king, act the part of a Thersites, when you can represent with so much dignity the elevated character of an Agamemnon?" The reproof was felt; Demades received his liberty; and Philip learned how to gain popularity even among his fallen enemies; by relieving their wants and easing their distresses. At the battle of Chaeronea the independence of Greece was extinguished; and Philip, unable to find new enemies in Europe, formed new enterprises, and meditated new conquests. He was nominated general of the Greeks against the Persians, and was called upon as well from inclination as duty to revenge those injuries which Greece had suffered from the invasions of Darius and of Xerxes. But he was stopped in the midst of his warlike preparations, being stabbed by Pausanias as he entered the theatre at the celebration of the nuptials of his daughter Cleopatra. This murder has given rise to many reflections upon the causes which produced it; and many who consider the recent repudiation of Olympias and the resentment of Alexander, are apt to investigate the causes of his death in the bosom of his family. The ridiculous honours which Olympias paid to her husband's murderer strengthened the suspicion; yet Alexander declared that he invaded the kingdom of Persia to revenge his father's death upon the Persian satraps and princes, by whose immediate intrigues the assassination had been committed. The character of Philip is that of a sagacious, artful, prudent, and intriguing monarch: he was brave in the field of battle, eloquent and dissimulating at home, and he possessed the wonderful art of changing his conduct according to the disposition and caprice of mankind, without ever altering his purpose, or losing sight of his ambitious aims. He possessed much perseverance, and in the execution of his plans he was always vigorous. He had that eloquence which is inspired by strong passions. The hand of an assassin prevented him from atchieving the boldest and the most extensive of his undertakings; and he might have acquired as many laurels, and conquered as many nations, as his son Alexander did in the succeeding reign; and the kingdom of Persia might have been added to the Macedonian empire, perhaps with greater moderation, with more glory, and with more lasting advantages. The private character of Philip lies open to censure, and raises indignation. The admirer of his virtues is disgusted to find him among the most abandoned prostitutes, and disgracing himself by the most unnatural crimes and lascivious indulgencies which can make even the most debauched and the most profligate to blush. He was murdered in the 47th year of his age, and the 24th of his reign, about 336 years before the Christian era. His reign is become uncommonly interesting, and his administration a matter of instruction. He is the first monarch whose life and actions are described with peculiar accuracy and historical faithfulness. Philip was the father of Alexander the Great and of Cleopatra, by Olympias; he had also by Audaca an Illyrian, Cyna, who married Amyntas the son of Perdiccas, Philip's elder brother; by Nicasipolis a Thessalian, Nicaea, who married Cassander; by Philaena a Larissaean

Philip. Lariffæan dancer, Aridæus, who reigned fome time after Alexander's death; by Cleopatra, the niece of Attalus, Caranus and Europa, who were both murdered by Olympias; and Ptolemy the firft king of Egypt, by Arfinoe, who in the firft month of her pregnancy was married to Lagus. Of the many memorable actions and fayings reported by Plutarch of this prince, the following are the moft remarkable. Being prefent at the fale of fome captives, in an indecent pofture, one of them informed him of it; "Set this man at liberty (fays Philip), I did not know that he was my friend." Being folicited to favour a lord of his court, who was like to lofe his character by a juft but fevere fentence, Philip refufed to hearken to the folicitation, and added, "I had rather that he be difgraced than myfelf." A poor woman was importuning him to do her juftice; and as he fent her away from day to day, under the pretence that he had no time to attend to her petition, fhe faid to him with fome warmth, "Ceafe then to be a king." Philip felt all the force of this reproof, and immediately gave her fatisfaction.—Another woman came to afk juftice of him as he was going out from a great entertainment, and was condemned. "I appeal (exclaimed fhe)!" "And to whom do you appeal (faid the king to her)?" "To Philip fafting." This anfwer opened the eyes of the monarch, who retracted his fentence. If he poffeffed any virtue, it was principally that of fuffering injuries with patience. Democharus, to whom the Greeks gave the furname of *Parrhefiaftes*, on account of his exceffive petulance of tongue, was one of the deputies whom the Athenians fent to this monarch. Philip, at the conclufion of the audience, begged the ambaffadors to tell him, "if he could be of any fervice to the Athenians;" to which Democharus gave an infolent return, which he forgave. Having learned that fome Athenian ambaffadors charged him, in full affembly, with atrocious calumnies: "I am under great obligations (faid he) to thofe gentlemen, for I fhall henceforwards be fo circumfpect in my words and actions, that I fhall convict them of falfehood." One faying of Philip, which does him lefs honour than thofe we have before mentioned, was, "Let us amufe children with playthings, and men with oaths." This abominable maxim, which was the foul and fpring of his politics, gave rife to the obfervation, "That he was in full length, what Louis XI. afterwards was in miniature." It is well known that Philip had a perfon about him, who called out at times, "Philip, remember that thou art mortal;" but whether we fhould place this to the account of his pride or his humility, it is difficult to fay.

Ibid. PHILIP V. was king of Macedonia, and fon of Demetrius. His infancy, at the death of his father, was protected by Antigonus, one of his friends, who afcended the throne, and reigned for 12 years, with the title of *Independent monarch*. When Antigonus died, Philip recovered his father's throne, though only 15 years of age, and he early diftinguifhed himfelf by his boldnefs and his ambitious views. He came to the throne in the year 220 before our Saviour, and the beginning of his reign was rendered glorious by the conquefts of Aratus; a general who was as eminent for his love of juftice as his fkill in war. But fo virtuous a character could hardly fail to be difagreeable to a prince who wanted to indulge himfelf in every fpecies of diffipation and vice; and indeed his cruelty to him foon difplayed his character in its true light; for to the gratification of every vice, and every extravagant propenfity, he had the meannefs to facrifice this faithful and virtuous Athenian. Not fatisfied with the kingdom of Macedonia, Philip afpired to become the friend of Hannibal, and wifhed to fhare with him the fpoils which the diftreffes and continual lofs of the Romans feemed foon to promife. But his expectations were fruftrated; the Romans difcovered his intrigues; and though weakened by the valour and artifice of the Carthaginian, yet they were foon enabled to meet him in the field of battle. The conful Lævinus entered without delay his territories of Macedonia; and after he had obtained a victory over him near Apollonia; and reduced his fleet to afhes, he compelled him to fue for peace. This peaceful difpofition was not permanent; and when the Romans difcovered that he had affifted their formidable enemy Hannibal with men and money, they appointed T. Q. Flaminius to punifh his perfidy, and the violation of the treaty. The Roman conful, with his ufual expedition, invaded Macedonia; and in a general engagement, which was fought near Cynocephale, the hoftile army was totally defeated, and the monarch faved his life with difficulty by flying from the field of battle. Deftitute of refources, without friends either at home or abroad, Philip was obliged to fubmit to the mercy of the conqueror, and to demand peace by his ambaffadors. It was granted with difficulty; the terms were humiliating; but the poverty of Philip obliged him to accept the conditions, however difadvantageous and degrading to his dignity. In the midft of thefe public calamities, the peace of his family was difturbed; and Perfes, the eldeft of his fons by a concubine, raifed feditions againft his brother Demetrius, whofe condefcenfion and humanity had gained popularity among the Macedonians, and who from his refidence at Rome, as an hoftage, had gained the good graces of the fenate, and by the modefty and innocence of his manners had obtained forgivenefs from that venerable body for the hoftilities of his father. Philip liftened with too much avidity to the falfe accufations of Perfes; and when he heard it afferted that Demetrius wifhed to rob him of his crown, he no longer hefitated to punifh with death fo unworthy and fo ungrateful a fon. No fooner was Demetrius facrificed to credulity, than Philip became convinced of his cruelty and rafhnefs; and to punifh the perfidy of Perfes, he attempted to make Antigonus, another fon, his fucceffor on the Macedonian throne. But he was prevented from executing his purpofe by death, in the 42d year of his reign, 178 years before the Chriftian era. The affaffin of Demetrius fucceeded his father, and with the fame ambition, with the fame rafhnefs and oppreffion, renewed the war againft the Romans, till his empire was deftroyed, and Macedonia became a Roman province. Philip has been compared with his great anceftor of the fame name; but though they poffeffed the fame virtues, the fame ambition, and were tainted with the fame vices, yet the father of Alexander was more fagacious and more intriguing, and the fon of Demetrius was more fufpicious, more cruel, and more implacable; and, according to the pretended prophecy of one of the Sybils, Macedonia was indebted to one Philip for her

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Philip. rise and consequence among nations, and under another Philip she lamented the loss of her power, her empire, and her dignity.

Ibid. PHILIP, *M. Julius*, a Roman emperor, of an obscure family in Arabia, from whence he was surnamed *Arabian*. From the lowest rank in the army he gradually rose to the highest offices; and when he was made general of the prætorian guards, he assassinated Gordian, to make himself emperor. To secure himself on the imperial throne, he left Mesopotamia a prey to the continual invasions of the Persians, and hurried to Rome, where his election was universally approved by the senate and the Roman people. Philip rendered his cause popular by his liberality and profusion; and it added much to his splendour and dignity, that the Romans during his reign commemorated the foundation of their city; a solemnity which was observed but once every 100 years, and which was celebrated with more pomp and more magnificence than under the preceding reigns. The people were entertained with games and spectacles; the theatre of Pompey was successively crowded during three days and three nights; and 2000 gladiators bled in the circus at once, for the amusement and pleasure of a gazing populace. His usurpation, however, was short. Philip was defeated by Decius, who had proclaimed himself emperor in Pannonia; and he was assassinated by his own soldiers near Verona, in the 45th year of his age, and the 5th of his reign. His son, who bore the same name, and who had shared with him the imperial dignity, was also massacred in the arms of his mother. Young Philip was then in the 12th year of his age, and the Romans lamented in him the loss of rising talents, of natural humanity, and endearing virtues.

Ibid. PHILIP, a native of Acarnania, physician to Alexander the Great. When that monarch had been suddenly taken ill, after bathing in the Cydnus, Philip undertook to remove the complaint, when the rest of the physicians believed that all medical assistance would be ineffectual. But as he was preparing his medicine, Alexander received a letter from Parmenio, in which he was advised to beware of his physician Philip, as he had conspired against his life. The monarch was alarmed; and when Philip presented him the medicine, he gave him Parmenio's letter to peruse, and began to drink the potion. The serenity and composure of Philip's countenance, as he read the letter, removed every suspicion from Alexander's breast, and he pursued the directions of his physician, and in a few days recovered.

There were, besides, a vast number of persons of this name in antiquity, and many of them were very eminent.

PHILIP I. king of France, succeeded his father Henry I. in 1060, when but eight years of age, under the regency and guardianship of Baudouin V. count of Flanders, who discharged his trust with zeal and fidelity. He defeated the Gascons who were inclined to revolt, and died, leaving his pupil 15 years of age. This young prince made war in Flanders against Robert, Baudouin's younger son, who had invaded Flanders, which belonged to the children of his elder brother. Philip marched against him with a numerous army, which was cut to pieces near Mount Cassel. Peace was the consequence of the victory, and the conqueror quietly enjoyed his usurpation. Philip, after the fatigues of the war, by way of relaxation gave himself up entirely to pleasure and dissipation. Tired of his wife Bertha, and fond of Bertrade, spouse of Foulques count of Anjou, he carried her off from her husband. Having, in 1093, legally annulled his own marriage under the pretext of barrenness, and Bertrade's marriage with the count of Anjou having been set aside under the same pretext, Philip and she were afterwards solemnly married by the bishop of Beauvais. This union was declared void by Pope Urban II. a Frenchman by birth, who pronounced the sentence in the king's own dominions, to which he had come for an asylum. Philip, fearing that the anathemas of the Roman pontiff might be the means of exciting his subjects to rebellion, sent deputies to the pope, who obtained a delay, during which time he was permitted to use the crown. To know what is meant by this permission, it is necessary to recollect, that at that period kings appeared on public solemnities in royal habit, with the crown on their heads, which they received from the hand of a bishop. This delay was not of long duration. Philip was excommunicated anew in a council held at Poictiers in 1100; but, in the year 1104, Lambert bishop of Arras, legate of Pope Pascal II. at last brought him his absolution to Paris, after having made him promise never to see Bertrade more; a promise which he did not keep. It would appear that the pope afterwards approved their marriage; for Suger informs us, that their sons were declared capable of succeeding to the crown. Philip died at Melun the 29th of July 1108, aged 57 years, after having witnessed the first crusade, in which he declined taking any part. His reign, which comprehends a period of 48 years, was the longest of any of his predecessors, excepting that of Clotarius, and of all who came after him, except those of Louis XIV. and Louis XV. It was distinguished by several great events; but Philip, though brave in battle, and wise in counsels, was no very excellent character. He appeared so much the more contemptible to his subjects, as that age abounded with heroes. Philip is not the first of the French monarchs (as is commonly reported), who, in order to give the greater authority to his charters, caused them to be subscribed by the officers of the crown; for Henry I. had sometimes done the same before him.

PHILIP II. surnamed *Augustus*, the *conqueror and given of God*, son of Louis VII. (called the *younger*), king of France, and of Alix, his third wife, daughter of Thibault, count of Champagne, was born the 22d of August 1165. He came to the crown, after his father's death in 1180, at the age of 15 years. His youth was not spent like that of the generality of other princes; for, by avoiding the rock of pleasure on which so many are apt to split, his courage thereby became the more lively and intrepid. The king of England seemed willing to take advantage of his minority, and to seize upon a part of his dominions. But Philip marched against him, and compelled him, sword in hand, to confirm the ancient treaties between the two kingdoms. As soon as the war was ended, he made his people enjoy the blessings of peace. He gave a check to the oppressions of the great lords, banished the comedians, punished blasphemies, caused the streets and public places of Paris to be paved, and annexed to that capital a part of the adjacent villages. It was enclosed by walls with towers; and

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and the inhabitants of other cities were equally proud to fortify and embellifh theirs. The Jews having for a long time practifed the moft fhameful frauds in France, Philip expelled them from his kingdom, and declared his fubjects quit with them; an action unjuft, contrary to the laws of nature, and confequently to religion. The tranquillity of France was fomewhat difturbed by a difference with the count of Flanders, which was however happily terminated in 1184. Some time after he declared war againft Henry II. king of England, and took from him the towns of Iffoudun, Tours, Mans and other places. The epidemical madnefs of the crufades then agitated all Europe; and Philip, as well as other princes, caught the infection. He embarked in the year 1190, with Richard I. king of England, for the relief of the Chriftians in Paleftine, who were oppreffed by Saladin. Thofe two monarchs fat down before Acre, which is the ancient Ptolemais; as did almoft all the Chriftians of the eaft, while Saladin was engaged in a civil war on the banks of the Euphrates. When the two European monarchs had joined their forces to thofe of the Afiatic Chriftians, they counted above 300,000 fighting men. Acre furrendered the 13th of July 1191; but the unhappy difagreement which took place between Philip and Richard, rivals of glory and of intereft, did more mifchief than could be compenfated by the fuccefsful exertions of thefe 300,000 men. Philip, tired of thefe divifions, and difpleafed with the behaviour of Richard his vaffal, returned to his own country, which, perhaps, he fhould never have left, or at leaft have feen again with more glory. Befides, he was attacked (fay hiftorians) with a languifhing diforder, the effects of which were attributed to poifon; but which might have been occafioned merely by the fcorching heat of a climate fo different from that of France. He loft his hair, his beard, and his nails; nay, his very flefh came off. The phyficians urged him to return home; and he foon determined to follow their advice. The year after, he obliged Baudouin VIII. count of Flanders to leave him the county of Artois. He next turned his arms againft Richard king of England, from whom he took Evreux and Vexin; though he had promifed upon the holy gofpels never to take any advantage of his rival during his abfence; fo that the confequences of this war were very unfortunate. The French monarch, repulfed from Rouen with lofs, made a truce for fix months; during which time he married Ingelburge, princefs of Denmark, whofe beauty could only be equalled by her virtue. The divorcing of this lady, whom he quitted in order to marry Agnes daughter of the duke of Merania, embroiled him with the court of Rome. The pope iffued a fentence of excommunication againft him; but it was taken off upon his promifing to take back his former wife. John Sans-terre fucceeded to the crown of England in 1199, to the prejudice of his nephew Arthur, to whom of right it belonged. The nephew, fupported by Philip, took up arms againft the uncle, but was defeated in Poictou, where he was taken prifoner, and afterwards murdered. The murderer, being fummoned before the court of the peers of France, not having appeared, was declared guilty of his nephew's death, and condemned to lofe his life in 1203. His lands, fituated in France, were forfeited to the crown. Philip foon fet about gathering the fruit of his vaffal's crime. He feized upon Normandy, then carried his victorious arms into Maine, Anjou, Touraine, Poictou, and brought thofe provinces, as they anciently were, under the immediate authority of his crown. The Englifh had no other part left them in France, but the province of Guienne. To crown his good fortune, John his enemy was embroiled with the court of Rome, which had lately excommunicated him. The ecclefiaftical thunder was very favourable for Philip. Innocent II. put into his hands, and transferred to him, a perpetual right to the kingdom of England. This king of France, when formerly excommunicated by the pope, had declared his cenfures void and abufive; he thought very differently, however, when he found himfelf the executor of a bull invefting him with the Englifh crown. To give the greater force to the fentence pronounced by his holinefs, he employed a whole year in building 1700 fhips, and in preparing the fineft army that was ever feen in France. Europe was in expectation of a decifive battle between the two kings, when the pope laughed at both, and artfully took to himfelf what he had beftowed upon Philip. A legate of the holy fee perfuaded John Sans-terre to give his crown to the court of Rome, which received it with enthufiafm. Then Philip was exprefsly forbid by the pope to make any attempt upon England, now become a fee of the Roman church, or againft John who was under her protection. Meanwhile, the great preparations which Philip had made, alarmed all Europe; Germany, England, and the Low Countries, were united againft him in the fame manner as we have feen them united againft Louis XIV. Ferrand, count of Flanders, joined the emperor Otho IV. He was Philip's vaffal; which was the ftrongeft reafon for declaring againft him. The French king was nowife difconcerted; his fortune and his courage diffipated all his enemies. His valour was particularly confpicuous at the battle of Bouvines, which was fought on the 27th of July 1214, and lafted from noon till night. Before the engagement, he knew well that fome of his nobles followed him with reluctance. He affembled them together; and placing himfelf in the midft of them, he took a large golden cup, which he filled with wine, and into which he put feveral flices of bread. He ate one of them himfelf, and offering the cup to the reft, he faid, "My companions, let thofe who would live and die with me follow my example." The cup was emptied in a moment, and thofe who were the leaft attached to him fought with all the bravery that could be expected from his warmeft friends. It is alfo reported, that after fhowing the army the crown that was worn by fovereigns upon thefe occafions, he faid, "If any one thought himfelf more worthy than he was to wear it, he had only to explain himfelf; that he fhould be content it were the prize of that man who fhould difplay the greateft valour in battle." The enemy had an army of 150,000 fighting men; that of Philip was not half fo numerous; but it was compofed of the flower of his nobility. The king run great hazard of his life; for he was thrown down under the horfes feet, and wounded in the neck. It is faid 30,000 Germans were killed; but the number is probably much exaggerated. The counts of Flanders and Boulogne were led to Paris with irons upon their feet and hands; a barbarous cuftom which prevailed at that time. The French king made no conqueft on the fide of Germany after

Philip.

after this ever-memorable action; but it gained him an additional power over his vassals. Philip, conqueror of Germany, and possessor of almost all the English dominions in France, was invited to the crown of England by the subjects of King John, who were grown weary of his tyranny. The king of France, upon this occasion, conducted himself like an able politician. He persuaded the English to ask his son Louis for their king; but as he wished at the same time to manage the pope, and not lose the crown of England, he chose to assist the prince his son, without appearing to act himself. Louis made a descent upon England, was crowned at London, and excommunicated at Rome in 1216; but that excommunication made no change upon John's situation, who died of grief. His death extinguished the resentment of the English, who having declared themselves for his son Henry III. forced Louis to leave England. Philip-Augustus died a little time after, at Mantes, the 14th of July 1223, aged 59, after a reign of 43 years. Of all the kings of the 3d race, he made the greatest accession to the crown-lands, and transmitted the greatest power to his successors. He re-united to his dominions Normandy, Anjou, Maine, Touraine, Poitou, &c. After having subdued John Sans-terre, he humbled the great lords, and by the overthrow of foreign and domestic enemies, took away the counterpoise which balanced his authority in the kingdom. He was more than a conqueror; he was a great king and an excellent politician; fond of splendour on public occasions, but frugal in private life; exact in the administration of justice; skilful in employing alternately flattery and threatenings, rewards and punishments; he was zealous in the defence of religion, and always disposed to defend the church; but he knew well how to procure from her succours for supplying the exigencies of the state. The lords of Coucy, Rhetel, Rosey, and several others, seized upon the property of the clergy. A great many of the prelates applied for protection to the king, who promised them his good offices with the depredators. But, notwithstanding his recommendations, the pillages continued. The bishops redoubled their complaints, and intreated Philip to march against their enemies. "With all my heart (said he); but in order to fight them, it is necessary to have troops, and troops cannot be raised without money." The clergy understood his meaning; they furnished subsidies, and the pillages ceased. The enterprises of Philip-Augustus were almost always successful; because he formed his projects with deliberation, and executed them without delay. He began by rendering the French happy, and in the end rendered them formidable; though he was more inclined to anger than to gentleness, to punish than to pardon, he was regretted by his subjects as a powerful genius and as the father of his country. It was in his reign that the marshal of France was seen, for the first time, at the head of the army. It was then, also, that families began to have fixed and hereditary surnames: the lords took them from the lands which they possessed; men of letters from the place of their birth; the converted Jews and rich merchants from that of their residence. Two very cruel evils, viz. leprosy and usury, were prevalent at that time; the one infected the body, the other proved the ruin of the fortunes of families. The number of lepers was so great, that the smallest villages were obliged to have an hospital for the cure of that distemper. It is remarkable, that when Philip was on the point of engaging Richard, the English, who were lying in ambush near the Loire, run away with his equipage, in which he caused to be carried all the deeds or writings respecting the rights of the crown; a custom which is used at this day by the grand seignior. Philip caused copies of his charters to be collected wherever they could be found; but after all his endeavours, some of them were never recovered. The surname of *Augustus* was given to Philip by his cotemporaries. Mezerai is mistaken, when he asserts that Paulus Emilius was the first who rendered the name of *conqueror* by that of Augustus; a learned critic has proved the contrary by undoubted authorities.

Philip.

Philip of *Valois*, first king of France of the collateral branch of the Valois, was son to Charles count of Valois, brother of Philip *the Fair*. He mounted the throne in 1328, on the death of his cousin Charles the Fair, after having held for some time the regency of the kingdom. France was much divided in the beginning of his reign, by disputes about the succession to the crown. Edward III. king of England laid claim to it as grandson of Philip the Fair, by his mother; but Philip of Valois took possession of it as first prince of the blood. The people gave him, upon his accession to the throne, the title of *fortunate*; to which might have been added, for some time, those of *victorious* and *just*. He marched to the relief of his vassal the count of Flanders, whose subjects, on account of bad usage, had taken up arms against him. He engaged the rebels at Cassel, performed prodigies of valour, and gained a signal victory, the 24th of August 1328. Having made all quiet, he went home, after saying to the count of Flanders, "Be more prudent and more humane, and you will have fewer disloyal subjects." The victorious Philip devoted the time of peace to the internal regulations of his kingdom. The financiers were called to an account, and some of them condemned to death; among others Peter Remi, general of the finances, who left behind him near 20 millions. He afterwards enacted the law respecting freeholds, imposing a tax upon churches, and commoners who had acquired the lands of the nobility. Then, also, began to be introduced the form of *appel comme d'abus*, the principles of which are more ancient than the name. The year 1329 was distinguished by a solemn homage paid to Philip, by Edward king of England, for the duchy of Guienne, upon his knees, and with his head uncovered. The interior peace of the kingdom was disturbed by disputes about the distinction of the church and state. An assembly was summoned for hearing the two parties, in the presence of the king: and in this assembly Peter de Cugnieres, his majesty's advocate, defended the secular jurisdiction with great ability, as a man well-informed, and an enlightened philosopher. Bertrand bishop of Autun, and Roger archbishop of Sens, pled the cause of the clergy with less ingenuity and judgment. This did not, however, prevent the king from showing them favours, though the controversy itself laid the foundation of all the disputes which were afterwards agitated about the authority of the two powers; disputes which contributed not a little to confine the ecclesiastical jurisdiction within narrower limits. While Philip was employing himself in some useful regulations, he was unhappily interrupted

Philip. by Edward III. declaring war againſt France. This prince immediately recovered thoſe parts of Guienne of which Philip was in poſſeſſion. The Flemiſh having again revolted from France in ſpite of oaths and treaties, joined the ſtandard of Edward; and required that he would aſſume the title of *king of France*, in conſequence of his pretenſions to the crown; becauſe then, agreeably to the letter of their treaty, they only followed the king of France. From this period is dated the union of the flower-de luce and leopards in the arms of England. Edward, in order to juſtify the change of his arms, cauſed the following manifeſto to be publiſhed in the verſe of the times.

Rex ſum regnorum, bina ratione, duorum:
Anglorum in regno ſum rex ego jure paterno;
Matris jure quidem Francorum nuncupor idem:
Hinc eſt armorum variatio facta meorum.

In the way of a parody to theſe lines, Philip made the following reply:

Prædo regnorum qui diceris eſſe duorum,
Francorum regno privaberis, atque paterno,
Succedunt mares huic regno, non mulieres:
Hinc eſt armorum variatio ſtulta tuorum.

In the mean time Philip put himſelf in a poſture of defence. His arms were at firſt attended with ſome ſucceſs; but thoſe advantages were far from compenſating the loſs of the battle of Ecluſe, in which the French fleet, conſiſting of 120 large ſhips, and manned by 40,000 ſeamen, was beat by that of England in the year 1340. This defeat is to be attributed, in part, to the little attention which had been paid to the navy of France, notwithſtanding her favourable ſituation, by being waſhed by two ſeas. She was obliged to make uſe of foreign ſhips, which obeyed but ſlowly, and even with ſome reluctance. This war, which had been alternately diſcontinued and renewed, began again with more heat than ever in 1345. The two armies having come to an engagement the 26th of Auguſt 1346, near Creſſy, a village in the county of Ponthieu, the Engliſh there gained a ſignal victory. Edward had only 40,000 men, while Philip had nearly twice that number; but the army of the former was inured to war, and that of the latter was ill-diſciplined and overcome with fatiguing marches. France loſt from 25,000 to 30,000 men; of which numbers were John king of Bohemia (who, though blind, fought gallantly), and about 1500 gentlemen, the flower of the French nobility. The loſs of Calais, and ſeveral other places, was the ſad fruit of this defeat. Some time before Edward had challenged Philip of Valois to a ſingle combat; which he refuſed, not on the ſcore of cowardice, but from the idea that it was improper for a ſovereign prince to accept a challenge from a king who was his vaſſal. At length, in 1347, a truce for ſix months was concluded between France and England, and afterwards prolonged at different times. Philip died a ſhort time after, the 23d of Auguſt 1350, aged 57 years, and far from bearing on his monument the title of *Fortunate*. He had, however, reunited Dauphiny to France. Humbert, the laſt prince of that country, having loſt all his children, and wearied with the wars which he had held out againſt Savoy, turned a Dominican, and gave his province to Philip, in 1349, on condition that the eldeſt ſon of the kings of France ſhould bear the title of Dauphin. Philip likewiſe added to his domain Rouſillon and a part of Cerdague, by lending ſome money to the king of Majorca, who gave him thoſe provinces as a ſecurity; provinces which Charles VIII. afterwards reſtored without any reimburſement. It is ſurpriſing that in ſo unfortunate a reign he ſhould have been able to purchaſe thoſe provinces after having paid a great deal for Dauphiny; but the duty on ſalt, the riſe on the other taxes, and eſpecially the frauds committed in the coinage of money, are ſuppoſed to have enabled him to make thoſe acquiſitions. The fictitious and ideal value of the coin was not only raiſed, but a great deal of bad money was iſſued from the mint. The officers of the mint were ſworn upon the goſpels to keep the ſecret: but how could Philip flatter himſelf that ſo groſs a fraud would not be diſcovered?

PHILIP II. ſon of Charles V. and of Iſabella of Portugal, who was born at Valladolid on the 21ſt of May 1527, became king of Naples and Sicily by his father's abdication in 1554. He aſcended the throne of Spain on the 17th of January 1556 by the ſame means. Charles had made a truce with the French, but his ſon broke it; and having formed an alliance with England, poured into Picardy an army of 40,000 men. The French were cut to pieces at the battle of St Quintin, which was fought on the 20th of Auguſt 1557. That town was taken by aſſault, and the day on which the breach was mounted Philip appeared armed cap-a-pee, in order to animate the ſoldiers. It was the firſt and laſt time that he was obſerved to wear this military dreſs. It is well known, indeed, that his terror was ſo great during the action that he made two vows; one, that he ſhould never again be preſent in a battle; and the other, to build a magnificent monaſtery dedicated to St Lawrence, to whom he attributed the ſucceſs of his arms, which he executed at Eſcurial, a village about ſeven leagues from Madrid. After the engagement, his general, the duke of Savoy, wanted to kiſs his hand; but Philip prevented him, ſaying, "It is rather my duty to kiſs your's, who have the merit of ſo glorious a victory;" and immediately preſented him with the colours taken during the action. The taking of Catelet, Ham, and Noyon, were the only advantages which were derived from a battle which might have proved the ruin of France. When Charles V. was informed of this victory, it is ſaid he aſked the perſon who brought him the intelligence, "if his ſon was at Paris?" and being anſwered in the negative, he went away without uttering a ſingle word. The duke of Guiſe having had time to aſſemble an army, repaired the diſgrace of his country by the taking of Calais and Thionville. While he was animating the French, Philip gained a pretty conſiderable battle againſt Marſhal de Thermes near Gravelines. His army was, on this occaſion, commanded by Count Egmont, whom he afterwards cauſed to be beheaded. The conqueror made no better uſe of the victory of Gravelines than he had done of that of St Quintin; but he reaped conſiderable advantage from the glorious peace of Cateau-Cambreſis, the maſterpiece of his politics. By that treaty, concluded the 13th of April 1559, he gained poſſeſſion of the ſtrong places of Thionville, Marienbourg, Montmedi, Heſdin, and the county of Charollois. This war, ſo terrible, and attended with ſo much cruelty, was terminated, like many others, by a marriage. Philip took for

Philip. for his third wife Elizabeth, daughter of Henry II. who had been promised to Don Carlos.

After these glorious achievements, Philip returned in triumph to Spain, without having drawn a sword. His first care, upon his arrival at Valladolid, was to demand of the grand inquisitor the spectacle of an *auto-da fé*. This was immediately granted him; 40 wretches, some of whom were priests or monks, were strangled and burnt, and one of them was burnt alive. Don Carlos de Seza, one of those unfortunate victims, ventured to draw near to the king, and said to him, "How, Sir, can you suffer so many wretches to be committed to the flames? Can you be witness of such barbarity without weeping?" To this Philip coolly replied, "If my own son were suspected of heresy, I would myself give him up to the severity of the inquisition. Such is the horror which I feel when I think of you and your companions, that if an executioner were wanting, I would supply his place myself." On other occasions he conducted himself agreeably to the spirit which had dictated this answer. In a valley of Piedmont, bordering on the country of the Milanese, there were some heretics; and the governor of Milan had orders to put them all to death by the gibbet. The new opinions having found their way into some of the districts of Calabria, he gave orders that the innovators should be put to the sword, with the reservation of 60 of them, of whom 30 were afterwards strangled, and the rest committed to the flames.

This spirit of cruelty, and shameful abuse of his power, had the effect to weaken that power itself. The Flemish, no longer able to bear so hard a yoke, revolted. The revolution began with the fine and large provinces of the continent; but the maritime provinces only obtained their liberty. In 1579 they formed themselves into a republic, under the title of the United Provinces. Philip sent the duke of Alva to reduce them; but the cruelty of that general only served to exasperate the spirit of the rebels. Never did either party fight with more courage, or with more fury. The Spaniards, at the siege of Haerlem, having thrown into the town the head of a Dutch officer who had been killed in a skirmish, the inhabitants threw to them the heads of eleven Spaniards, with this inscription: "Ten heads for the payment of the tenth penny, and the eleventh for interest." Haerlem having surrendered at discretion, the conquerors caused all the magistrates, all the pastors, and above 1500 citizens, to be hanged.

The duke of Alva being at length recalled, the grand commander of the Requesnes was sent in his place, and after his death Don John of Austria; but neither of those generals could restore tranquillity in the Low Countries. To this son of Charles V. succeeded a grandson no less illustrious, namely, Alexander Farnese duke of Parma, the greatest man of his time; but he could neither prevent the independence of the United Provinces, nor the progress of that republic which arose under his own eye. It was then that Philip, always at his ease in Spain, instead of coming to reduce the rebels in Flanders, proscribed the prince of Orange, and set 25,000 crowns upon his head. William, superior to Philip, disdained to make use of that kind of vengeance, and trusted to his sword for his preservation.

In the mean time the king of Spain succeeded to the crown of Portugal, to which he had a right by his mother Isabella. This kingdom was subjected to him by the duke of Alva, in the space of three weeks, in the year 1580. Antony, prior of Crato, being proclaimed king by the populace of Lisbon, had the resolution to come to an engagement; but he was vanquished, pursued, and obliged to fly for his life. Philip.

A cowardly assassin, Balthazar Gerard, by a pistol-shot killed the prince of Orange, and thereby delivered Philip from his most implacable enemy. Philip was charged with this crime, it is believed without reason; though, when the news was communicated to him, he was imprudent enough to exclaim, "If this blow had been given two years ago, the Catholic religion and I would have gained a great deal by it."

This murder had not the effect to restore to Philip the Seven United Provinces. That republic, already powerful by sea, assisted England against him. Philip having resolved to distress Elizabeth, fitted out, in 1588, a fleet called the *Invincible*. It consisted of 150 large ships, on which were mounted 2650 pieces of cannon, 8000 seamen, 20,000 soldiers, and all the flower of the Spanish nobility. This fleet, commanded by the duke of Medina Sidonia, sailed from Lisbon when the season was too far advanced; and, being overtaken by a violent storm, a great part of it was dispersed. Twelve ships, driven upon the coast of England, were captured by the English fleet, which consisted of 100 ships; 50 were wrecked on the coasts of France, Scotland, Ireland, Holland, and Denmark. Such was the success of the Invincible. See ARMADA.

This enterprise, which cost Spain 40 millions of ducats, 20,000 men, and 100 ships, was productive only of disgrace. Philip supported this misfortune with a heroic resolution. When one of his courtiers told him, with an air of consternation, what had happened, he coolly replied, "I sent to fight the English, and not the winds. God's will be done." The day after Philip ordered the bishops to return thanks to God for having preserved some remains of his fleet; and he wrote thus to the pope: "Holy father, as long as I remain master of the fountain head, I shall not much regard the loss of a rivulet. I will thank the Supreme Disposer of empires, who has given me the power of easily repairing a disaster which my enemies must attribute solely to the elements which have fought for them."

At the same time that Philip attacked England, he was encouraging in France the Holy League; the object of which was to overturn the throne and divide the state. The leaguers conferred upon him the title of *Protector* of their association; which he eagerly accepted, from a persuasion that their exertions would soon conduct him, or one of his family, to the throne of France. He thought himself so sure of his prey, that when speaking of the principal cities in France, he used to say, "My fine city of Paris, my fine city of Orleans," in the same manner as he would have spoken of Madrid and Seville. What was the result of all those intrigues? Henry IV. embraced the Catholic religion, and by his abjuration of Protestantism made his rival lose France in a quarter of an hour.

Philip, at length, worn out by the debaucheries of his youth, and by the toils of government, drew near his last hour. A slow fever, the most painful gout, and a complication of other disorders, could not disengage him from business, or draw from him the least complaint.

Philip.

plaint. "What!" said he to the physicians who hesitated about letting blood of him; "What! are you afraid of drawing a few drops of blood from the veins of a king who has made whole rivers of it flow from heretics?" At last, exhausted by a complication of distempers, which he bore with a heroic patience, and being eaten up of lice, he expired the 13th of September 1598, aged 72 years, after a reign of 43 years and eight months. During the last 50 days of his illness he showed a great sense of religion, and had his eyes almost always fixed towards heaven.

Watson's Philip II.

No character was ever drawn by different historians in more opposite colours than that of Philip; and yet, considering the length and activity of his reign, there is none which it should seem would be more easy to ascertain. From the facts recorded in history, we cannot doubt that he possessed, in an eminent degree, penetration, vigilance, and a capacity for government. His eyes were continually open upon every part of his extensive dominions. He entered into every branch of administration; watched over the conduct of his ministers with unwearied attention; and in his choice both of them and of his generals, discovered a considerable share of sagacity. He had at all times a composed and settled countenance, and never appeared to be either elated or depressed. His temper was the most imperious, and his looks and demeanor were haughty and severe; yet among his Spanish subjects he was of easy access; listened patiently to their representations and complaints; and where his ambition and bigotry did not interfere, was generally willing to redress their grievances. When we have said thus much in his praise, we have said all that truth requires or truth permits. It is indeed impossible to suppose that he was insincere in his zeal for religion. But as his religion was of the most corrupt kind, it served to increase the natural depravity of his disposition; and not only allowed, but even prompted, him to commit the most odious and shocking crimes. Although a prince in the bigotted age of Philip might be persuaded that the interest of religion would be advanced by falsehood and persecution; yet it might be expected, that, in a virtuous prince, the sentiments of honour and humanity would on some occasions triumph over the dictates of superstition: but of this triumph there occurs not a single instance in the reign of Philip; who without hesitation violated his most sacred obligations as often as religion afforded him a pretence, and under that pretence exercised for many years the most unrelenting cruelty without reluctance or remorse. His ambition, which was exorbitant; his resentment, which was implacable; his arbitrary temper, which would submit to no controul—concurred with his bigotted zeal for the Catholic religion, and carried the sanguinary spirit, which that religion was calculated to inspire, to a greater height in Philip than it ever attained in any other prince of that or of any former or succeeding age.

Though of a small size, he had an agreeable person. His countenance was grave, his air tranquil, and one could not discover from his looks either joy in prosperity or chagrin in adversity. The wars against Holland, France, and England, cost Philip 564 millions of ducats; but America furnished him with more than the half of that sum. His revenues, after the junction of Portugal, are said to have amounted to 25 millions of ducats, of which he only laid out 100,000 for the support of his own household. Philip was very jealous of outward respect; he was unwilling that any should speak to him but upon their knees. The duke of Alva having one day entered this prince's cabinet without being introduced, he received the following harsh salutation, accompanied with a stormy countenance: "An impudence like this of yours would deserve the hatchet." If he thought only how to make himself be feared, he succeeded in doing so; for few princes have been more dreaded, more abhorred, or have caused more blood to flow, than Philip II. of Spain. He had successively, if not all at once, war to maintain against Turkey, France, England, Holland, and almost all the Protestants of the empire, without having a single ally, not even the branch of his own house in Germany. Notwithstanding so many millions employed against the enemies of Spain, Philip found in his economy and his resources wherewith to build 30 citadels, 64 fortified places, 9 sea ports, 25 arsenals, and as many palaces, without including the Escurial. His debts amounted to 140 millions of ducats, of which after having paid seven millions of interest, the greatest part was due to the Genoese. Moreover, he had sold or alienated a capital stock of 100 millions of ducats in Italy. He made a law, fixing the majority of the kings of Spain at 14 years of age. He affected to be more than commonly devout; he ate often at the refectory with the monks; he never entered their churches without kissing all the relics; he caused knead his bread with the water of a fountain which was thought to possess a miraculous virtue; he boasted of never having danced, and of never wearing breeches after the Grecian fashion. Grave and solemn in all his actions, he drove from his presence a woman who had smiled while he was blowing his nose. One great event of his domestic life is the death of his son Don Carlos. The manner of this prince's death is not certainly known. His body, which lies in the monument of the Escurial, is there separated from his head; but it is pretended that the head is separated only because the leaden coffin which contains the body is too small. The particulars of his crime are as little known as the manner in which it was committed. There is no evidence, nor is there any probability, that Philip would have caused him to be condemned by the inquisition. All that we know of the matter is, that in 1568 his father, having discovered that he had some correspondence with the Hollanders his enemies, arrested him himself in his own room. He wrote at the same time to Pope Pius V. in order to give him an account of his son's imprisonment; and in his letter to this pontiff, the 20th of January 1568, he says, "that from his earliest years the strength of a wicked nature has stifled in Don Carlos every paternal instruction." It was Philip II. who caused to be printed at Anvers, between 1569 and 1572, in 8 vols folio, the fine Polyglot Bible, which bears his name; and it was he who subjected the islands afterwards called the *Philippines*. He married successively, 1st, Mary daughter of John III. king of Portugal; 2dly, Mary daughter of Henry VIII. and queen of England; 3dly, Elizabeth of France, daughter of Henry II.; 4thly, Anne daughter of the emperor Maximilian II. Don Carlos was the son of his first wife, and Philip III. of the last.

Philip, Philippi.

PHILIPPI, in *Ancient Geography*, a town of Macedonia,

Philippi.

donia, in the territory of the Edones, on the confines of Thrace (Pliny, Ptolemy), situated on the side of a steep eminence; anciently called *Datum* and *Drenides* (Appian), though Strabo seems to distinguish them. This town was famous on several accounts; not only as taking its name from the celebrated Philip of Macedon, father to Alexander the Great, who considered it as a fit place for carrying on the war against the Thracians, but also on account of two battles fought in its neighbourhood between Augustus and the republican party. In the first of these battles, Brutus and Cassius had the command of the republican army; while Octavianus, afterwards Augustus, and Mark Antony, had the command of their adversaries. The army of Brutus and Cassius consisted of 19 legions and 20,000 horse; the imperial forces of an equal number of legions, but more complete, and 13,000 horse; so that the numbers on both sides were pretty equal. The troops of Brutus were very richly dressed, most of them having their armour adorned with gold and silver; for Brutus, though very frugal in other respects, was thus extravagant with respect to his men, thinking that the riches that they had about them would make them exert themselves the more, to prevent these from falling into the enemy's hands. Both the republican generals appear to have been inferior in skill to Mark Antony; for as to Octavianus, he is allowed never to have conquered but by the valour of others. A little before the first engagement, Octavianus, who had been indisposed, was carried out of the camp, at the persuasion of Artorius his physician, who had dreamed that he saw a vision directing him to be removed. Brutus's men, who opposed the wing commanded by Octavianus, charged without orders, which caused great confusion. However, they were successful; for part of them, taking a compass about, fell upon the enemy's rear: after which they took and plundered the camp, making a great slaughter of such as were in it, and among the rest putting 2000 Lacedæmonians to the sword who were newly come to the assistance of Octavianus. The emperor himself was sought for, but in vain, having been conveyed away for the reason above mentioned; and as the soldiers pierced the litter in which he was usually carried, it was thence reported that he had been killed. This threw that whole part of the army into such consternation, that when Brutus attacked them in front, they were most completely routed; three whole legions being cut in pieces, and a prodigious slaughter made among the fugitives. But by the imprudence of the general in pursuing too far, the wing of the republican army commanded by Cassius was left naked and separated from the rest of the army; on which they were attacked at once in front and in flank, and thus they were defeated and their camp taken, while Brutus imagined that he had gained a complete victory. Cassius himself retired to an eminence at a small distance from Philippi; whence he sent one of his greatest intimates to procure intelligence concerning the fate of Brutus. That general was on his way, and already in view, when the messenger set out. He soon met his friends; but they surrounding him to inquire the news, Cassius, who beheld what passed, imagined that he was taken prisoner by the enemy, retired to his tent, and in despair caused one of his freedmen cut off his head. Thus far at least is certain, that he went into the tent with that freedman, and that his head was found separated from his body when Brutus entered. However, the freedman was never afterwards seen.

Philippi, Philippics.

The second engagement was pretty similar to the first. Brutus again opposed Octavianus, and met with the same success; but in the mean time Antony, to whom he ought undoubtedly to have opposed himself, having to do only with the lieutenants of Cassius, gained a complete victory over them. What was worst, the fugitives, instead of leaving the field of battle altogether, fled for protection to Brutus's army; where crowding in among the ranks, they carried despair and confusion wherever they went, so that a total defeat ensued, and the republican army was almost entirely cut in pieces. After the battle, Brutus put an end to his own life, as is related more fully under the article Rome.

The city of Philippi is likewise remarkable on account of an epistle written by St Paul to the church in that place. It was a Roman colony (Luke, Pliny, Coin, Inscription). It is also remarkable for being the birth-place of Adrastus, the Peripatetic philosopher, and disciple of Aristotle.—The town is still in being, and is an archbishop's see; but greatly decayed and badly peopled. However, there is an old amphitheatre, and several other monuments of its ancient grandeur. E. Long. 44. 55. N. Lat. 41. 0.

PHILIPPICS, Φιλιππικοι λογοι, in literature, is a name which is given to the orations of Demosthenes against Philip king of Macedon. The Philippics are reckoned the master-pieces of that great orator: Longinus quotes many instances of the sublime from them; and points out a thousand latent beauties. Indeed that pathetic in which Demosthenes excelled, the frequent interrogations and apostrophes wherewith he attacked the indolence of the Athenians, where could they be better employed? Whatever delicacy there be in the oration against Leptines, the Philippics have the advantage over it, were it only on account of the subject, which gives Demosthenes so fair a field to display his chief talent, we mean, with Longinus, that of moving and astonishing.

Dionysius Halicarnasseus ranks the oration on the Halonese among the Philippics, and places it the eighth in order: but though his authority be great, yet that force and majesty wherein Cicero characterizes the Philippics of Demosthenes, seem to exclude the oration on the Halonese out of the number; and authorize the almost universal opinion of the learned, who reject it as spurious. Libanius, Photius, and others, but above all the languidness of the style, and the lowness of the expressions, which reign throughout the whole, father it on Hegesippus.

Philippics is likewise applied to the fourteen orations of Cicero against Mark Antony. Cicero himself gave them this title in his epistles to Brutus; and posterity have found it so just, that it has been continued to our times. Juvenal, Sat. x. calls the second the *divine Philippic*, and witnesses it to be of great fame, *conspicuæ divina Philippica famæ*. That orator's intitling his last and most valued orations after the Philippics of Demosthenes shews the high opinion he had of them. Cicero's Philippics cost him his life; Mark Antony having been so irritated with them, that when he arrived at the triumvirate, he procured Cicero's murder.

Philippics, Philippine Iſlands.

der, cut off his head, and ſtuck it up in the very place whence the orator had delivered the Philippics.

PHILIPPINE ISLANDS, are certain iſlands of Aſia, which lie between 114 and 126 degrees of eaſt longitude, and between 6 and 20 degrees of north latitude; about 300 miles ſouth-eaſt of China. They are ſaid to be about 1200 in number, of which there are 400 very conſiderable. They form a principal diviſion of that immenſe Indian Archipelago, which conſiſts of ſo many thouſand iſlands, ſome of which are the largeſt, and many of them the richeſt, in the world. The Philippines form the northernmoſt cluſter of theſe iſlands, and were diſcovered in the year 1521 by the famous navigator Ferdinand Magellan, a Portugueſe gentleman, who had ſerved his native country both in the wars of Africa and in the Eaſt Indies; particularly under Albuquerque, the famous Portugueſe general, who reduced Goa and Malacca to the obedience of that crown. Magellan having had a conſiderable ſhare in thoſe actions, and finding himſelf neglected by the government of Portugal, and even denied, as it is ſaid, the ſmall advance of a ducat a month on his pay, left the court of Portugal in diſguſt, and offered his ſervices to Charles V. then emperor of Germany and king of Spain, whom he convinced of the probability of diſcovering a way to the Spice iſlands, in the Eaſt Indies, by the weſt: whereupon the command of five ſmall ſhips being given him, he ſet ſail from Seville, on the 10th of Auguſt 1519, and ſtanding over to the coaſt of South America, proceeded ſouthward to 52°, where he fortunately hit upon a ſtrait, ſince called the *Strait of MAGELLAN*, which carried him into the Pacific ocean or South ſea; and then ſteering northward, repaſſed the equator: after which, he ſtretched away to the weſt, acroſs that vaſt ocean, till he arrived at Guam, one of the Ladrones, on the 10th of March 1521; and ſoon after ſailed to the weſtward, and diſcovered the Philippines, which he did on St Lazarus's day; and, in honour of that ſaint, he called them the *Archipelago of St Lazarus*. He took poſſeſſion of them in the name of the king of Spain, but happened to be killed in a ſkirmiſh he had with the natives of one of them. His people, however, arrived afterwards at the Moluccas, or Clove iſlands, where they left a colony, and returned to Spain by the way of the Cape of Good Hope; being the firſt perſons that ever ſailed round the globe.—But there was no attempt made by the Spaniards to ſubdue or plant the Philippine iſlands until the year 1564, in the reign of Philip II. ſon of Charles V. when Don Louis de Velaſco, viceroy of Mexico, ſent Michael Lopez Delagaſpes thither with a fleet, and a force ſufficient to make a conqueſt of theſe iſlands, which he named the *Philippines*, in honour of Philip II. then upon the throne of Spain: and they have remained under the dominion of that crown till taken by Sir William Draper. The Philippines are ſcarce inferior to any other iſlands of Aſia in all the natural productions of that happy climate; and they are by far the beſt ſituated for an extenſive and advantageous commerce. By their poſition, they form the centre of intercourſe with China, Japan, and the Spice iſlands; and whilſt they are under the dominion of Spain, they connect the Aſiatic and American commerce, and become a general magazine for the rich manufactures of the one and for the treaſures of the other. Beſides, they are well ſituated for a ſupply of European goods, both from the ſide of Acapulco and by the way of the Cape of Good Hope. In fact, they formerly enjoyed a traffic in ſome degree proportioned to the peculiar felicity of their ſituation; but the Spaniſh dominion is too vaſt and unconnected to be improved to the beſt advantage.—The ſpirit of commerce is not powerful in that people. The trade of the Philippines is thought to have declined; its great branch is now reduced to two ſhips, which annually paſs between theſe iſlands and Acapulco in America, and to a ſingle port of Manilla in the iſland of Luconia.

Beatſon's Mil. Mem.

Philippine Iſlands.

Indeed the Spaniards appear by no means to be actuated by the ſpirit of induſtry; for, ſo far from improving the fine ſituation of theſe iſlands to the utmoſt, it happens, on the contrary, that the trade is hurtful to the mother-country; for (to confine ourſelves to Manilla, with which they have moſt to do), inſtead of taking Spaniſh manufactures, they trade with the Chineſe for ſpices, ſilks, ſtockings, Indian ſtuffs, callicoes, chintz, and many other articles; and with the Japaneſe for cabinets, and all ſorts of lacquered ware; for all which they pay in gold or ſilver. All theſe commodities, together with what the iſlands produce, and great quantities of wrought plate by the Chineſe artiſans, are collected at Manilla, and tranſported annually in two ſhips to Acapulco in Mexico. Each of theſe ſhips is eſteemed worth 600,000l. ſterling; and in the war which began in 1739, and which was not diſtinguiſhed by ſuch a ſeries of wonderful ſucceſſes as that which ended in 1763, the taking of one of the galleons which carry on the trade between Manilla and America, was conſidered as one of the moſt brilliant advantages which we gained. This trade is not laid open to all the inhabitants of Manilla, but is confined by very particular regulations, ſomewhat analogous to thoſe by which the trade of the regiſter ſhips from Cadiz to the Weſt Indies is reſtrained. The ſhips employed are all king's ſhips, commiſſioned and paid by him; and the tonnage is divided into a certain number of bales, all of the ſame ſize. Theſe are divided among the convents at Manilla, but before the ſuppreſſion of the Jeſuits principally among them, as a donation to ſupport their miſſions, for the propagation of the Roman Catholic faith. Moſt of the religious are concerned in this trade, and ſell to the merchants at a great price what room in the ſhip they are not to occupy. This trade is by a royal edict limited to a certain value, but it always exceeds it, each ſhip being generally worth 3,000,000 of dollars. The returns made from America are in ſilver, cochineal, ſweetmeats, together with ſome European millinery ware for the women, and ſome ſtrong Spaniſh wine. It is obvious, that the greateſt part of the treaſure remitted does not remain at Manilla, but is diſperſed over India for goods. Many ſtrong remonſtrances againſt this Indian trade to Mexico have been made to the court of Spain, wherein they urge, that the ſilk manufactories of Valentia and other parts of Spain, the linens from Cadiz, and their other manufactories, are hurt in their ſale in Mexico and Peru, by the Chineſe being able to afford them goods of the ſame ſort cheaper than they are able; that were this trade laid open, the whole treaſure of the New World would centre in Spain, or with European merchants; but now it enriches only ſome religious orders and a few private perſons. Wiſe as theſe arguments are, the Jeſuits and prieſts, verſant in intrigue,

 and

and the moſt ſelfiſh ſet of men on earth, had intereſt enough at court to ſtop the effect.

At Cavite in this bay are a fort, a town, and a fine dock-yard, where theſe large galleons are built and repaired, and where they load and unload, together with all the other large ſhips that trade to this bay.

The principal of the Philippine iſlands are Luconia or Manilla, Tandago or Samar, Maſbate, Mindora, Luban, Paragoa, Panay, Leyte, Bohel, Sibu, Sogbu, Negros, St John, Xolo, and Mindanao. In moſt of theſe, the Spaniſh power prevails, and all are under the governor of Luconia; but there are ſome in which that nation has little authority, or even influence, ſuch as Mindanao.

The inhabitants of theſe iſlands conſiſt of Chineſe, Ethiopians, Malays, Spaniards, Portugueſe, Pintados or Painted People, and Meſtees, a mixture of all theſe. Their perſons and habits reſemble thoſe of the ſeveral nations whence they derive their original; only, it is obſervable, that the features of the blacks of theſe iſlands are as agreeable as thoſe of the white people. There is not a ſoil in the world that produces greater plenty of all things for life; as appears by the multitude of inhabitants to be found in the woods and mountains, who ſubſiſt almoſt entirely by the fruits of the earth, and the veniſon they take. Nor can any country appear more beautiful; for there is a perpetual verdure, and buds, bloſſoms, and fruit, are found upon the trees all the year round, as well on the mountains as in the cultivated gardens. Vaſt quantities of gold are waſhed down from the hills by the rains, and found mixed with the ſand of their rivers. There are alſo mines of other metals, and excellent loadſtones, found here; and ſuch numbers of wild buffaloes, that a good huntſman on horſeback, armed with a ſpear, may kill 10 or 20 in a day. The Spaniards take them for their hides, which they ſell to the Chineſe; and their carcaſes ſerve the mountaineers for food. Their woods alſo abound with deer, wild hogs, and goats. Of the laſt, there is ſuch plenty in one of theſe iſlands, that the Spaniards gave it the name of *Cabras*. Horſes and cows have been likewiſe imported into theſe iſlands, from New Spain, China, and Japan, which have multiplied conſiderably; but the ſheep that were brought over came to nothing. The trees produce a great variety of gums; one kind, which is the commoneſt, by the Spaniards called *brea*, is uſed inſtead of pitch; of the others ſome are medicinal, others odoriferous.

In thoſe iſlands are monkeys and baboons of ſuch a ſize, as to defend themſelves if attacked by men. When they can find no fruit in the mountains, they go down to the ſea to catch crabs and oyſters; and that the oyſters may not cloſe and catch their paws, they firſt put in a ſtone to prevent their ſhutting cloſe: they take crabs by putting their tail in the holes where they lie, and when the crab lays hold of it, they draw him out. There are alſo great numbers of civet-cats in ſome of the iſlands. The bird called *tavan*, is a black ſea-fowl, ſomething leſs than a hen, and has a long neck; it lays its eggs in the ſand by the ſea-ſide, 40 or 50 in a trench, and then covers them, and they are hatched by the heat of the ſun. They have likewiſe the bird *ſaligan*, which builds her neſt on the ſides of rocks. This is a ſpecies of ſwallow the neſts of which are ſo much eſteemed in the eaſt, being a kind of jelly that diſſolves in warm water.

The Spaniards have introduced ſeveral of the American fruits, which thrive here as well as in America; the cocoa or chocolate-nut particularly, which increaſes ſo that they have no occaſion now to import it from Mexico. Here is alſo the *FOUNTAIN-Tree*, from which the natives draw water; and there is likewiſe a kind of cane, by the Spaniards called *vavuco*, which, if cut, yields fair water enough for a draught, of which there is plenty in the mountains, where water is moſt wanted.

Theſe iſlands being hot and moiſt, produce abundance of venomous creatures, as the ſoil does poiſonous herbs and flowers, which do not kill thoſe who touch or taſte them, but ſo infect the air, that many people die in the time of their bloſſoming.

The orange, lemon, and ſeveral other trees, bear twice a-year. A ſprig, when planted, becomes a tree and bears fruit in a year's time; ſo that without any hyperbole it may be affirmed, that a more luxuriant verdant ſoil can ſcarcely be conceived. The woods are filled with old, large, and lofty trees, and ſuch as yield more ſuſtenance to man than is to be found in almoſt any other part of the world. Theſe iſlands, however, beſides their other inconveniences, of which they have many, are very ſubject to earthquakes, which often prove very fatal. See MANILLA.

PHILIPPINES, a religious ſociety of young women at Rome, ſo called from their taking St Philip de Neri for their protector. The ſociety conſiſts of 100 poor girls, who are brought up till they are of age to be married, or become nuns, under the direction of ſome religious women, who teach them to read, write, and work, and inſtruct them in the duties of Chriſtianity. They wear a white veil, and a black croſs on their breaſts. See MACEDONIA.

PHILIPPISTS, a ſect or party among the Lutherans; the followers of Philip Melancthon. He had ſtrenuouſly oppoſed the Ubiquiſts, who aroſe in his time; and the diſpute growing ſtill hotter after his death, the univerſity of Wirtemberg, who eſpouſed Melancthon's opinion, were called by the Flacians, who attacked it, *Philippiſts*.

PHILIPS, FABIAN, was author of ſeveral books relating to ancient cuſtoms and privileges in England. He was born at Preſtbury in Glouceſterſhire, September 28. 1601. When very young, he ſpent ſome time in one of the Inns of Chancery; and went from thence to the Middle-Temple, where he became learned in the law. In the civil wars, he was a bold aſſertor of the king's prerogative; and was ſo ſtrongly attached to Charles I. that, two days before that monarch was beheaded, he wrote a proteſtation againſt the intended murder, and cauſed it to be printed, and affixed to poſts in all public places. He likewiſe publiſhed, in 1649, 4to, a pamphlet entitled, "*Veritas Inconcuſſa;* or King Charles I. no Man of Blood, but a Martyr for his People:" which was reprinted in 1660, 8vo. In 1663, when the courts of juſtice at Weſtminſter, eſpecially the chancery, were voted down by Oliver's parliament, he publiſhed, "Conſiderations againſt the diſſolving and taking them away:" for which he received the thanks of parliament. He was for ſome time filazer for London,

Philips. don, Middlefex, Cambridgefhire, and Huntingdonfhire; and fpent much money in fearching records, and writing in favour of the royal prerogative. The only advantage he received for this attachment to the royal caufe was, the place of one of the commiffioners for regulating the law, worth 200l. per annum, which only lafted two years. After the reftoration of Charles II. when the bill for taking away the tenures was depending in parliament, he wrote and publifhed a book to fhow the neceffity of preferving them, entitled, "*Tenenda non tollenda;* or, the Neceffity of preferving Tenures *in capite*, and by Knight's-fervice, which, according to their firft inftitution, were, and are yet, a great part of the *falus populi*, &c. 1660," 4to. In 1663 he publifhed, "The Antiquity, Legality, Reafon, Duty, and Neceffity of Pre-emption and Pourveyance for the King," 4to; and afterwards many other pieces upon fubjects of a fimilar kind. He affifted Dr Bates in his "*Elenchus Motuum;* efpecially in fearching the records and offices for that work. He died, November 17th, 1690, in his 89th year. He was a man well acquainted with records and antiquities; but his manner of writing is neither clofe nor well digefted. He publifhed a political pamphlet in 1681, entitled, "*Urfa Major et Minor;* fhowing that there is no fuch Fear, as is factitioufly pretended, of Popery and arbitrary Power."

Philips, *Ambrofe*, an Englifh poet, was defcended from a very ancient and confiderable family of that name in Leicefterfhire. He received his education at St John's college, Cambridge; during his ftay at which univerfity, he wrote his paftorals, which acquired him at that time fo high a reputation. His next performance was, The Life of Archbifhop Williams, written, according to Mr Cibber, to make known his political principles, which in the courfe of it he had a free opportunity of doing, as the archbifhop, who is the hero of his work, was a ftrong opponent to the high-church meafures.

When he quitted the univerfity, and came to London, he became a conftant attendant at, and one of the wits of, Button's coffee-houfe, where he obtained the friendfhip and intimacy of many of the celebrated geniufes of that age, more particularly of Sir Richard Steele, who, in the firft volume of his Tatler, has inferted a little poem of Mr Philips's, which he calls a Winter Piece, dated from Copenhagen, and addreffed to the earl of Dorfet, on which he beftows the higheft encomiums; and, indeed, fo much juftice is there in thefe his commendations, that even Mr Pope himfelf, who had a fixed averfion to the author, while he affected to defpife his other works, ufed always to except this from the number.

The firft diflike Mr Pope conceived againft Mr Philips, proceeded from that jealoufy of fame which was fo confpicuous in the character of that great poet; for Sir Richard Steele had taken fo ftrong a liking to the paftorals of the latter, as to have formed a defign for a critical comparifon of them with thofe of Pope, in the conclufion of which the preference was to have been given to Philips. This defign, however, coming to Mr Pope's knowledge, that gentleman, who could not bear a rival near the throne, determined to ward off this ftroke by a ftratagem of the moft artful kind; which was no other than taking the fame tafk on himfelf; and, in a paper in the Guardian, by drawing the like comparifon, and giving a like preference, but on principles of criticifm apparently fallacious, to point out the abfurdity of fuch a judgment. However, notwithftanding the ridicule that was drawn on him in confequence of his ftanding as it were in competition with fo powerful an antagonift, it is allowed, that there are, in fome parts of Philips's paftorals, certain ftrokes of nature, and a degree of fimplicity, that are much better fuited to the purpofes of paftoral, than the more correctly turned periods of Mr Pope's verfification. Mr Philips and Mr Pope being of different political principles, was another caufe of enmity between them; which arofe at length to fo great a height, that the former, finding his antagonift too hard for him at the weapon of wit, had even determined on making ufe of a rougher kind of argument; for which purpofe he even went fo far as to hang up a rod at Button's for the chaftifement of his adverfary whenever he fhould come thither; which, however, Mr Pope declining to do, avoided the *argumentum baculinum*, in which he would, no doubt, have found himfelf on the weakeft fide of the queftion. Our author alfo wrote feveral dramatical pieces; The Briton, Diftreffed Mother, and Humphrey Duke of Gloucefter; all of which met with fuccefs, and one of them is at this time a ftandard of entertainment at the theatres, being generally repeated feveral times in every feafon. Mr Philips's circumftances were in general, through his life, not only eafy, but rather affluent, in confequence of his being connected, by his political principles, with perfons of great rank and confequence. He was concerned with Dr Hugh Boulter, afterwards archbifhop of Armagh, the right honourable Richard Weft, Efq; lord chancellor of Ireland, the reverend Mr Gilbert Burnet, and the reverend Mr Henry Stevens, in writing a feries of papers called the *Free Thinker*, which were all publifhed together by Mr Philips, in three volumes in 12mo.

In the latter part of Queen Anne's reign, he was fecretary to the Hanover club, who were a fet of noblemen and gentlemen who had formed an affociation in honour of that fucceffion, and for the fupport of its interefts, and who ufed particularly to diftinguifh in their toafts fuch of the fair fex as were moft zealoufly attached to the illuftrious Houfe of Brunfwic. Mr Philips's ftation in this club, together with the zeal fhown in his writings, recommended him to the notice and favour of the new government. He was, foon after the acceffion of King George I. put into the commiffion of the peace, and appointed one of the commiffioners of the lottery. And, on his friend Dr Boulter's being made primate of Ireland, he accompanied that prelate acrofs St George's Channel, where he got confiderable preferments beftowed on him, and was elected a member of the Houfe of Commons there, as reprefentative for the county of Armagh. At length, having purchafed an annuity for life of 400l. per annum, he came over to England fome time in the year 1748; but having a very bad ftate of health, and being moreover of an advanced age, he died foon after, at his lodgings near Vauxhall, in Surrey.

"Of his perfonal character (fays Dr Johnfon) all I have heard is, that he was eminent for bravery, and fkill in the fword, and that in converfation he was folemn and pompous." He is fomewhere called *Quaker Philips*, but, however, appears to have been a man of integrity;

Philips.

grity; for the late Paul Whitehead relates, that when Mr Addiſon was ſecretary of ſtate, Philips applied to him for ſome preferment, but was coolly anſwered, "that it was thought that he was already provided for, by being made a juſtice for Weſtminſter." To this obſervation our author, with ſome indignation, replied, "Though poetry was a trade he could not live by, yet he ſcorned to owe ſubſiſtence to another which he ought not to live by."

The following anecdote is told of our author by Dr Johnſon: "At a coffee-houſe, he (Philips) was diſcourſing upon pictures, and pitying the painters, who, in their hiſtorical pieces, always draw the ſame ſort of *ſky*." "They ſhould travel (ſaid he), and then they would ſee that there is a different *ſky* in every country, in England, France, Italy, and ſo forth." "Your remark is juſt (ſaid a grave gentleman who ſat by), I have been a traveller, and can teſtify what you obſerve is true; but the greateſt variety of *ſkies* that I found was in Poland." "In Poland, Sir? (ſays Philips)." "Yes, in Poland; for there is Sobie*ſky*, and Sabrun*ſky*, and Jablon*ſky*, and Podebra*ſky*, and many more *ſkies*."

Philips, *Catharine*, a very ingenious lady, the daughter of Mr John Fowler merchant, was born at London in January 1631, and educated at a ſchool at Hackney. She married James Philips of the priory of Cardigan, Eſq. and went with the viſcounteſs of Dungannon into Ireland, where ſhe tranſlated Corneille's tragedy of Pompey into Engliſh, which was ſeveral times acted there with great applauſe.

She tranſlated alſo the four firſt acts of Horace, another tragedy of Corneille, the fifth being done by Sir John Denham. This excellent and amiable lady, for ſuch it ſeems ſhe was, died of the ſmall-pox in London the 22d of June 1664, much and juſtly regretted; "having not left (ſays Langbaine) any of her ſex her equal in poetry.—She not only equalled (adds he) all that is reported of the poeteſſes of antiquity, the Leſbian Sappho and the Roman Sulpitia, but juſtly found her admirers among the greateſt poets of our age." Cowley wrote an ode upon her death. Dr Jeremy Taylor had addreſſed to her his "Meaſures and Offices of Friendſhip:" the ſecond edition of which was printed in 1657, 12mo. She aſſumed the name of *Orinda*. In 1667, were printed, in folio, "Poems by the moſt deſervedly admired Mrs Catharine Philips, the matchleſs Orinda. To which is added, Monſieur Corneille's Pompey and Horace, tragedies. With ſeveral other tranſlations from the French;" and her picture before them, engraven by Faithorne. There was likewiſe another edition in 1678, folio; in the preface of which we are told, that "ſhe wrote her familiar letters with great facility, in a very fair hand, and perfect orthography; and if they were collected with thoſe excellent diſcourſes ſhe wrote on ſeveral ſubjects, they would make a volume much larger than that of her poems." In 1705, a ſmall volume of her letters to Sir Charles Cottrel was printed, under the title of "Letters from Orinda to Poliarchus." The editor of theſe letters tells us, that "they were the effect of an happy intimacy between herſelf and the late famous Poliarchus, and are an admirable pattern for the pleaſing correſpondence of a virtuous friendſhip. They will ſufficiently inſtruct us, how an intercourſe of writing between perſons of different ſexes ought to be managed with delight and innocence; and teach the world not to load ſuch a commerce with cenſure and detraction, when it is removed at ſuch a diſtance from even the appearance of guilt."

Philips.

Philips, *John*, an eminent Engliſh poet, was born in 1676. He was educated at Wincheſter and Oxford, where he became acquainted with Milton, whom he ſtudied with great application, and traced in all his ſucceſsful tranſlations from the ancients. The firſt poem which diſtinguiſhed our author, was his Splendid Shilling, which is in the Tatler ſtyled the "fineſt burleſque poem in the Engliſh language." His next was entitled Blenheim, which he wrote at the requeſt of the earl of Oxford, and Mr Henry St John, afterwards Lord Bolingbroke, on the victory obtained there by the duke of Marlborough in 1704. It was publiſhed in 1705; and the year after he finiſhed another poem upon cyder, the firſt book of which had been written at Oxford. It is on the model of Virgil's Georgics, and is a very excellent piece. We have no more of Mr Philips but a Latin ode to Henry St John, Eſq. which is eſteemed a maſterpiece. He was contriving greater things; but illneſs coming on, he was obliged to drop every thing but the care of his health. This care, however, did not ſave him: for, after lingering a long time, he died at Hereford, Feb. 15. 1708, of a conſumption and aſthma, before he had reached his 33d year. He was interred in the cathedral of that city, with an inſcription over his grave; and had a monument erected to his memory in Weſtminſter-abbey by Sir Simon Harcourt, afterwards lord-chancellor, with an epitaph upon it written by Dr Atterbury, though commonly aſcribed to Dr Freind. He was one of thoſe few poets whoſe muſe and manners were equally excellent and amiable; and both were ſo in a very eminent degree.

Dr Johnſon obſerves, that "Philips has been always praiſed, without contradiction, as a man modeſt, blameleſs, and pious; who bore a narrow fortune without diſcontent, and tedious and painful maladies without impatience; beloved by thoſe that knew him, but not ambitious to be known. He was probably not formed for a wide circle. His converſation is commended for its innocent gaiety, which ſeems to have flowed only among his intimates; for I have been told, that he was in company ſilent and barren, and employed only upon the pleaſures of his pipe. His addiction to tobacco is mentioned by one of his biographers, who remarks, that in all his writings except Blenheim he has found an opportunity of celebrating the fragrant fume. In common life, he was probably one of thoſe who pleaſe by not offending, and whoſe perſon was loved, becauſe his writings were admired. He died honoured and lamented before any part of his reputation had withered, and before his patron St John had diſgraced him. His works are few. The Splendid Shilling has the uncommon merit of an original deſign, unleſs it may be thought precluded by the ancient *Centos*. To degrade the founding works and ſtately conſtruction of Milton, by an application to the loweſt and moſt trivial things, gratifies the mind with a momentary triumph over that grandeur which hitherto held its captives in admiration; the words and things are preſented with a new appearance, and novelty is always grateful where it gives no pain. But the merit of ſuch performances begins and ends

with

Philips, Philipsburg.

with the first author. He that should again adapt Milton's phrase to the gross incidents of common life, and even adapt it with more art, which would not be difficult, must yet expect but a small part of the praise which Philips has obtained: he can only hope to be considered as the repeater of a jest.

"There is a Latin ode written to his patron St John, in return for a present of wine and tobacco, which cannot be passed without notice. It is gay and elegant, and exhibits several artful accommodations of classic expressions to new purposes. It seems better turned than the odes of Hannes. To the poem on cyder, written in imitation of the Georgics, may be given this peculiar praise, that it is grounded in truth; that the precepts which it contains are exact and just; and that it is therefore at once a book of entertainment and of science. This I was told by Miller, the great gardener and botanist, whose expression was, that 'there were many books written on the same subject in prose, which do not contain so much truth as that poem.' In the disposition of his matter, so as to intersperse precept, relating to the culture of trees, with sentiments more generally pleasing, and in easy and graceful transitions from one subject to another, he has very diligently imitated his master; but he unhappily pleased himself with blank verse, and supposed that the numbers of Milton, which impress the mind with veneration, combined as they are with subjects of inconceivable grandeur, could be sustained by images which at most can rise only to elegance. Contending angels may shake the regions of heaven in blank verse; but the flow of equal measures, and the embellishment of rhime, must recommend to our attention the art of engrafting, and decide the merit of the redstreak and pearmain. What study could confer, Philips had obtained; but natural deficiency cannot be supplied. He seems not born to greatness and elevation. He is never lofty, nor does he often surprise with unexpected excellence: but perhaps to his last poem may be applied what Tully said of the work of Lucretius, that 'it is written with much art, though with few blazes of genius."

It deserves to be remarked, that there were two poets of both the names of our author, and who flourished in his time. One of them was Milton's nephew, and wrote several things, particularly some memoirs of his uncle, and part of Virgil Travestied. The other was the author of two political farces, which were both printed in 1716; 1. The Earl of Marr married, with the Humours of Jocky the Highlander. 2. The Pretender's Flight; or a Mock Coronation, with the Humours of the facetious Harry St John.

PHILIPSBURG, is an imperial town of Germany, in the circle of the Upper Rhine. It is very strong, and looked upon as one of the bulwarks of the empire. It is seated in a morass, and fortified with seven bastions, and several advanced works. The town belongs to the bishop of Spire, but all the works and the fortifications to the empire. It has been several times taken and retaken, particularly by the French in 1734, when the duke of Berwick was killed at the siege; but it was rendered back the year following, in consequence of the treaty of Vienna. It is seated on the river Rhine, over which there is a bridge, seven miles south of Spire, 22 south-east of Worms, and 40 north east of Strasburg. E. Long. 8. 33. N. Lat. 49. 12.

Philistæa, Philistines.

PHILISTÆA, in *Ancient Geography*, the country of the Philistines (Bible); which lay along the Mediterranean, from Joppa to the boundary of Egypt, and extending to inland places not far from the coast. *Palæstini*, the people; *Palæstina*, the country (Josephus): Afterwards applied to the whole of the Holy Land and its inhabitants. *Philistæi*, the people (Septuagint); *Philistini* (Vulgate); the *Caphtorim* and *Philistim*, originally from Egypt, and descendants of Cham (Moses). Expelled and destroyed the Hivites the ancient inhabitants, and occupied their country; that is, the region which retained the name of *Philistim*, in which that of *Caphtorim* was swallowed up.

PHILISTINES, were the ancient inhabitants of Palestine, well known in sacred history. These people are sometimes called in Scripture *Cherethites* and *Caphtorims*. The earlier part of their history is, like that of most other nations, very obscure and uncertain. The authors of the Universal History tell us, that they were descended from the Casluhim partly, and partly from the Caphtorim, both from the loins of Mizraim the son of Ham, the son of Noah. Moses tells us (Deut. xi. 23.), that they drove out the Avim or Avites even to Azzah or Gazah, where they settled; but when this happened cannot be determined. On the whole, however, our learned authors are clearly of opinion, that the Casluhim and Caphtorim, from whom the Philistines are descended, came originally from Egypt, and called the country which they had conquered by their own name (See PALESTINE). Many interpreters, however, think, that Caphtor was but another name for Cappadocia, which they imagine to have been the original country of the Philistines. But Father Calmet, in a particular dissertation prefixed to the first book of Samuel, endeavours to show that they were originally of the isle of Crete. The reasons which led him to think that Caphtor is the isle of Crete are as follow: The Philistines were strangers in Palestine, as appears in various parts of Scripture; such as Gen. x. 14. Deut. ii. 23. Jer. xlvii. 4. and Amos ix. 7. whence the Septuagint always translate this name *Strangers*. Their proper name was Cherethims, for Ezekiel (xxv. 16.), speaking against the Philistines, has these words, "I will stretch out mine hand upon the Philistines, and I will cut off the Cherethims, and destroy the remnant of the sea coast." Zephaniah (ii. v.), inveighing against the same people, says, "Woe unto the inhabitants of the sea-coasts, the nation of the Cherethites." And Samuel (Book I. xxx. 14.) says, that the Amalekites made an irruption into the country of the Cherethites, that is to say, of the Philistines, as the sequel of the discourse proves. And afterwards the kings of Judah had foreign guards called the *Cherethites* and *Pelethites*, who were of the number of the Philistines (2 Sam. xv. 18.). The Septuagint, under the name *Cherethites*, understood the *Cretans*; and by *Cherith* they understood *Crete*. Besides the Scripture says, that the Philistines came from the isle of Caphtor. Now we see no island in the Mediterranean wherein the marks whereby the Scripture describes Caphtor and Cherethim agree better than in the isle of Crete. The name *Cretim* or *Cherethim* is the same with that of *Cretenses*. The Cretans are one of the most ancient and celebrated people, which inhabited the islands of the Mediterranean. They pretended to have been produced:

Philiftines. duced originally out of their own foil. This ifland was well peopled in the time of the Trojan war. Homer calls it the ifland with a hundred cities. The city of Gaza in Paleftine went by the name of *Minoa (Steph. Byzant. in Gaza)*, becaufe Minos king of Crete coming into that country, called this ancient city by his own name.

Herodotus acknowledges that the Cretans were originally all barbarians, and did not come from Greece. Homer fays, that a different language was fpoken in the ifle of Crete; that there were Greeks there, true or ancient Cretans, Pelafgians, &c. The ancient Cretans are the fame as the Cherethites, the Pelafgians as the Philiftines or Pelethites of the Scripture: their language was the fame with that of the Canaanites or Phœnicians, that is, Hebrew: they were defcended, as well as Canaan, from Ham, by Mizraim (Gen. x. 6, 13, 14.). The manners, arms, religion, and gods of the Cretans and Philiftines were the fame. The arms of the one and the other were bows and arrows. Dagon the god of the Philiftines was the fame as the Dictynna of the Cretans.

Whether thefe arguments are convincing, it is not for us to determine; but Wells does not think they are, as he is of the fame opinion with the authors of the Univerfal Hiftory, who fay, that *Coptus*, the name of an old city of Egypt, is a corruption of the ancient *Caphtor*. It is not, however, of great importance to determine whether they came from Crete, from Cappadocia, or from Egypt: they had certainly been a confiderable time in the land of Canaan, when Abraham arrived there in the year of the world 2083. They were then a very powerful people, were governed by kings, and in poffeffion of feveral confiderable cities. The race of kings then in power were honoured with the title of *Abimelech*. This race, however, was but of fhort duration; for their monarchy became an ariftocracy of five lords, who were, as far as we can difcover, partly independent of each other, though they acted in concert for the common caufe. This form of government was again fucceeded by another race of kings, diftinguifhed by the title of *Achifh*, though they alfo bore that of *Abimelech*. The kings were always under great limitations. The Philiftines appear to have been a very warlike people, induftrious, and lovers of freedom; they did not circumcife, and in the early periods of their hiftory held adultery in the greateft abhorrence. "Their character (fay the authors of the Univerfal Hiftory) muft be confidered at different periods; for we may fay they were not always the fame people. In the days of Abraham and Ifaac, they were without all doubt a righteous and hofpitable nation: but afterwards a revolution in government, religion, and morals, may have enfued. From thenceforward they became like other idolatrous nations; the fame enormities crept in and prevailed among them.

Anc. part, vol. i. p. 408, &c.

They are conftantly mentioned in Scripture as ftrangers; and, though poffeffed of a very confiderable part of the Land of Promife, yet God would never fuffer them to be driven out, they being Egyptians by defcent, and not original natives, whofe land only was promifed to Abraham and his feed. Their arrogance and ambition were great; and fo irreconcileable was their enmity (A) to the Ifraelites, that one would be almoft tempted to think they were created on purpofe to be a thorn in their fides; for though the hand of God was evidently againft them feveral times, and particularly when they detained the ark, yet they hardened their hearts, and clofed their eyes againft conviction. They feem to have entertained a very fond veneration for their deities, in which they perfifted, though they were eye witneffes of the fhame and ignominy which befel them in the prefence of the captive ark; nay, they were fo biaffed in their favour, as to imagine that their gods might prevail againft Him who had in fo glaring a manner put them to fhame and difgrace. They were much engaged in trade; which, confidering their fituation, they may have exercifed from the beginning; but, by the acceffion of the fugitive Edomites in David's time, they rofe to fo great a reputation as merchants, that the Greeks, it feems, preferred them to all other nations in that refpect, and from them called all the country bordering on theirs *Paleftine*. Their language was not fo different from that fpoken by the Hebrews as to caufe any difficulty for them to converfe together, as will be perceived by their intercourfe with Abraham and Ifaac; fo that, in all this region, the feveral nations fpoke one and the fame tongue, perhaps with fome variation of dialect. They had doubtlefs the arts and fciences in common with the moft learned and ingenious among their contemporaries, and perhaps fome of them in greater perfection. They had giants among them; but whether they were originally of the breed of the Anakims, who retired hither when they were expelled from Hebron, or were fprung from accidental births, is not eafily determined. We muft not forget, that the invention of the bow and arrow is afcribed to this people.

"Their religion was different at different times; under their firft race of kings, they ufed the fame rites with the Hebrews. Abimelech, in the fin he had like to have committed with Sarah, through Abraham's timidity, was favoured with a divine admonition from God; and, by his fpeech and behaviour at that time, it feems as if he had been ufed to converfe with the Deity. In after-times, they fell into endlefs fuperftitions, and different kinds of idolatry; each of the principal or five cities feemed to have an idol of its own. Marna, Marnas, or Marnath, was worfhipped at Gaza, and is faid to have migrated into Crete, and to have become the Cretan Jupiter. Dagon was worfhipped at Azotus; he feems to have been the greateft, the moft ancient, and moft

(A) "From a paffage in Chronicles, it is gueffed to have been of very ancient date; where it is faid, that 'the men of Gath flew the children of Ephraim, who would have taken their cattle from them.' This incident is nowhere elfe to be found; and there are various notions concerning the fenfe in which we muft take this paffage. As to the time of the tranfaction, moft people allow it to have been while the children of Ifrael were fojourners in Egypt. It plainly appears, by the next verfe, that Ephraim himfelf was living at that period. The Targum fuppofes his children mifcomputed the time they were to ferve in Egypt, and began too early an attempt upon their Promifed Land."

Philistines. most favourite god they had; to which may be added, that he perhaps subsisted the longest of any that did not straggle out of the country. To him they ascribed the invention of bread-corn, or of agriculture, as his name imports. We cannot enter into the common notion of his being represented as a monster, half man half fish; nor consequently into another, almost as common, that he is the same with the Syrian goddess Dereeto, who, we are told, was represented under some such mixed form. Our opinion is, that this idol was in shape wholly like a man; for we read of his head, his hands, and his feet. He stood in a temple at Azotus, and had priests of his own who paid him a very constant attendance. Next to Dagon was Baalzebub the god of Ekron. In the text of the New Testament he is called *Beelzebub*, and the *prince of devils*. His name is rendered *lord of flies*; which by some is held to be a mock appellation bestowed on him by the Jews; but others think him so styled by his worshippers, as Hercules Apomyios and others were, from his driving those insects away; and urge, that Ahaziah, in his sickness, would scarcely have applied to him, if his name had carried in it any reproach. But it must be remembered, it is the sacred historian that makes use of that contemptuous term in derision; whereas the idolatrous monarch, who was one of his votaries, might call him by his common name, supposed to have been *Baal-zebaoth*, 'the lord of armies,' or *Baal-shamim*, 'lord of heaven,' or some other bordering on Baal-zebub. How, or under what form he was represented is uncertain: some place him on a throne, and attire him like a king; others paint him as a fly. Not to dwell on this obscurity, it appears that he became an oracle of the highest repute for omniscience and veracity; that he had priests of his own; and that he, in the middle times at least, was much sought after by those who were anxious about futurity. Derceto we take certainly to have been the goddess of Ascalon; but we are supported by profane authority, without the least countenance from Scripture. Gath is seemingly the only city of all the five unprovided with a deity; wherefore, as the Scripture declares, that Ashtaroth, or Astarte, was worshipped by this people, we are ready to place her at Gath, and the rather, as this of all their cities may have had most communication with Sidon. To speak in general concerning their religious rites and ceremonies, which is all we can do, they seem to have erected very large and spacious temples, or very wide halls, for the celebration of their solemn seasons and festivals (for such they surely had); their religious offices were attended with much pomp, and a great concourse from all parts; and they presented their gods with the chief part of their spoil, and carried them about with them when they went to war. We do not find in Scripture that they sacrificed their children; and yet the Curetes (B) are said to be their descendants."

With respect to the history of this extraordinary people, we find from the above extract, that they were not comprehended in the number of nations devoted to extermination, and whose territory the Lord had abandoned to the Hebrews; nor were they of the cursed seed of Canaan. However, Joshua did not forbear to give their lands to the Hebrews, and to set upon them by command from the Lord, because they possessed a country which was promised to the people of God (Josh. xv. 45.—47. and xiii. 2, 3.). But these conquests of Joshua must have been ill maintained, since under the Judges, under Saul, and at the beginning of the reign of David, the Philistines oppressed the Israelites. True it is, Shamgar, Samson, Samuel, and Saul, made head against them, but did not reduce their power; and they continued independent down to the reign of David, who subjected them to his government.

They continued in subjection to the kings of Judah down to the reign of Jehoram, son of Jehoshaphat; that is, for about 246 years. However, Jehoram made war against them, and probably reduced them to his obedience again; because it is observed in Scripture, that they revolted again from Uzziah; and that this prince kept them to their duty during the time of his reign (2 Chron. xxi. 16. and xxvi. 6, 7.). During the unfortunate reign of Ahaz, the Philistines made great havock in the territories of Judah; but his son and successor Hezekiah subdued them (2 Chron. xxviii. 18. and 2 Kings xviii. 8.). Lastly, they regained their full liberty under the latter kings of Judah; and we may see by the menaces denounced against them by the prophets Isaiah, Amos, Zephaniah, Jeremiah, and Ezekiel, that they brought a thousand hardships and calamities upon the children of Israel: for which cruelties God threatened to punish them. Esarhaddon besieged Ashdod or Azoth, and took it (Isa. xx. 1.). And according to Herodotus, Psammeticus king of Egypt took the same city, after a siege of 29 years. There is great probability, that Nebuchadnezzar, when he subdued the Ammonites, Moabites, Egyptians, and other nations bordering upon the Jews, reduced also the Philistines. After this, they fell under the dominion of the Persians; then under that of Alexander the Great, who destroyed the city of Gaza, the only city of Phœnicia that durst oppose him. After the persecution of Antiochus Epiphanus, the Asmonæans subjected under their obedience several cities of the Philistines; and Tryphon gave to Jonathan Maccabæus the government of the whole coast of the Mediterranean, from Tyre as far as Egypt, which included all the country of the Philistines.

PHILLYREA, Mock-privet; a genus of plants belonging to the diandria class. See Botany *Index*.

Philistines || Philo.

PHILO, an ancient Greek writer, was of a noble family among the Jews, and flourished at Alexandria during the reign of Caligula. He was the chief of an embassy sent to Rome about the year 42, to plead the cause of the Jews against Apion, who was sent by the Alexandrians to charge them with neglecting the honours due to Cæsar. Caligula, however, would not allow him to speak, and behaved to him in such a manner that Philo was

(B) "The Curetes sacrificed their children to Saturn; and from the similitude this name bears to Cherethites or Philistines, it has been advanced that they are the same people; but as we have no warrant for saying the Philistines practised so barbarous and unnatural a custom, we may venture to pronounce, that they learned it not from them, but borrowed it elsewhere."

Philo.

was in considerable danger of losing his life. Others again tell us that he was heard; but that his demands were refused. He afterwards went to Rome in the reign of Claudius; and there, Eusebius and Jerome inform us, he became acquainted with St Peter, with whom he was on terms of friendship. Photius adds, that he became a Christian, and afterwards, from some motive of resentment, renounced it. Great part of this, however, is uncertain, for few believe that St Peter was at Rome so early as the reign of Claudius, if he ever was there at all.

Philo was educated at Alexandria, and made very great progress in eloquence and philosophy. After the fashion of the time, he cultivated, like many of his nation and faith, the philosophy of Plato, whose principles he so thoroughly imbibed, and whose manner he so well imitated, that it became a common saying, "Aut Plato philonizat, aut Philo platonizat." Josephus says, he was a man "eminent on all accounts:" and Eusebius describes him, "copious in speech, rich in sentiments, and sublime in the knowledge of holy writ." He was, however, so much immersed in philosophy, particularly the Platonic, that he neglected the Hebrew language, and the rites and customs of his own people. Scaliger says, that Philo "knew no more of Hebrew and Syriac than a Gaul or a Scythian." Grotius is of opinion, that "he is not fully to be depended on, in what relates to the manners of the Hebrews:" and Cudworth goes further; for "though a Jew by nation (says he), he was yet very ignorant of Jewish customs." Fabricius thinks differently; for though he allows some inadvertencies and errors of Philo with regard to these matters, yet he does not see a sufficient foundation on which to charge so illustrious a doctor of the law with ignorance. He allows, however, that Philo's passion for philosophy had made him more than half a Pagan; for it led him to interpret the whole law and the prophets upon Platonic ideas; and to admit nothing as truly interpreted which was not agreeable to the principles of the academy. Besides, this led him farther; he turned every thing into allegory, and deduced the darkest meanings from the plainest words. This most pernicious practice ORIGEN, it is known, imitated, and exposed himself by it to the scoffs of Celsus and of Porphyry. Philo's writings abound with high and mystical, new and subtile, far-fetched and abstracted, notions; and indeed the doctrines of Plato and Moses are so promiscuously blended, that it is not an easy matter to assign to each his principles. There are certainly, however, in his works many excellent things. Though he is continually Platonising and allegorising the Scriptures, he abounds with fine sentiments and lessons of morality; and his morals are rather the morals of a Christian than of a Jew. History, together with his own writings, give us every reason to believe that he was a man of great prudence, constancy, and virtue.

His works were first published in Greek by Turnebus at Paris 1552. A Latin translation made by Gelenius was afterwards added, and printed several times with it. The Paris edition of 1640 in folio was the best for a whole century; which made Cotelerius say, that "Philo was an author that deserved to have a better text and a better version." In 1742, a handsome edition of his work was published at London by Dr Mangey in two volumes folio; which is certainly preferable if it were only for the paper and print, but it is not so good a one as Philo deserves.

Philocles || Philolaus.

Many of our readers may be desirous of further details respecting this celebrated man; we refer such therefore to Josephus's Antiquities, Eusebius's Ecclesiastical History, St Jerome's work *De Scriptoribus Ecclesiasticis*, *Fabricius Bibl. Græc. Cave Hist. Liter.* and vol. ii. of Monuments of the Greek Church.

PHILOCLES, an admiral of the Athenian fleet during the Peloponnesian war. He recommended to his countrymen to cut off the right hand of such of the enemies as were taken, that they might be rendered unfit for service. His plan was adopted by all the ten admirals except one; but their expectations were frustrated, and instead of being conquerors they were totally defeated at Ægospotamos by Lysander, and Philocles was put to death with the rest of his colleagues.

PHILOCTETES, in fabulous history, the son of Pæan, was the faithful companion of Hercules; who at his death obliged him to swear not to discover the place where his ashes were interred, and presented him with his arrows dipped in the Hydra's blood. The Greeks at the siege of Troy being informed by an oracle that they could never take that city without those fatal arrows, went to Philoctetes, and insisted upon his discovering where he had left his friend; when Philoctetes, to evade the guilt of perjury, let them know where Hercules was intombed, by stamping upon the place: but he was punished for the violation of his oath, by dropping an arrow upon that foot; which, after giving him great agony, was at length cured by Machaon. He was afterwards taken by Ulysses to the siege of Troy, where he killed Paris with one of his arrows.

PHILOLAUS, of Crotona, was a celebrated philosopher of antiquity, of the school of Pythagoras, to whom that philosopher's *Golden Verses* have been ascribed. He made the heavens his principal object of contemplation; and has been idly (A) supposed to have been the author of that true system of the world which Copernicus afterwards revived. This made Bullialdus place the name of Philolaus at the head of two works, written to illustrate and confirm that system.

"He was (says Dr Enfield) a disciple of Archytas, and flourished in the time of Plato. It was from him that Plato purchased the written records of the Pythagorean system, contrary to an express oath taken by the society of Pythagoreans, pledging themselves to keep secret the mysteries of their sect. It is probable, that among these books were the writings of Timæus, upon which Plato formed the dialogue that bore his name. Plutarch relates, that Philolaus was one of the persons who escaped from the house which was burned by Cylon, during the life of Pythagoras; but this account cannot be correct. Philolaus was contemporary with Plato, and therefore certainly not with Pythagoras. Interfering

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(A) We say idly, because there is undoubted evidence that Pythagoras learned that system in Egypt. See PHILOSOPHY.

Philolaus. terfering in affairs of ſtate, he fell a ſacrifice to political jealouſy.

"Philolaus treated the doctrine of nature with great ſubtlety, but at the ſame time with great obſcurity; referring every thing that exiſts to mathematical principles. He taught, that reaſon, improved by mathematical learning, is alone capable of judging concerning the nature of things; that the whole world conſiſts of infinite and finite; that number ſubſiſts by itſelf, and is the chain which by its power ſuſtains the eternal frame of things; that the Monad is not the ſole principle of all things, but that the Binary is neceſſary to furniſh materials from which all ſubſequent numbers may be produced; that the world is one whole, which has a fiery centre, about which the ten celeſtial ſpheres revolve, heaven, the ſun, the planets, the earth, and the moon; that the ſun has a vitreous ſurface, whence the fire diffuſed through the world is reflected, rendering the mirror from which it is reflected viſible; that all things are preſerved in harmony by the law of neceſſity; and that the world is liable to deſtruction both by fire and by water. From this ſummary of the doctrine of Philolaus it appears probable, that, following Timæus, whoſe writings he poſſeſſed, he ſo far departed from the Pythagorean ſyſtem as to conceive two independent principles in nature, God and Matter, and that it was from the ſame ſource that Plato derived his doctrine upon this ſubject."

PHILOLOGY.

1 Definition. PHILOLOGY is compounded of the two Greek words φιλος and λογος, and imports "the deſire of inveſtigating the properties and affections of *words*." The ſages of Greece were, in the moſt ancient times, denominated Σοφοι, that is, *wiſe men*. Pythagoras renounced this pompous appellation, and aſſumed the more humble title of φιλοσοφος, that is, *a lover of wiſe men*. The learned Greeks were afterwards called *philoſophers*; and in proceſs of time, in imitation of this epithet, the word *philologer* was adopted, to import "a man deeply verſed in languages, etymology, antiquities, &c." Hence the term *philology*, which denotes the ſcience that we propoſe briefly to diſcuſs in the following article.

Though philology, in its original import, denoted only the ſtudy of words and language, it gradually acquired a much more extenſive, and at the ſame time a much

2 Objects and uſes of philology. more uſeful, as well as more exalted, ſignification. It comprehended the ſtudy of grammar, criticiſm, etymology, the interpretation of ancient authors, antiquities; and, in a word, every thing relating to ancient manners, laws, religion, government, language, &c. In this enlarged ſenſe of the word, philology becomes a ſcience of the greateſt utility; opens a wide field of intellectual inveſtigation; and indeed calls for a more intenſe exertion of induſtry, and multifarious erudition, than moſt of thoſe departments of literature which cuſtom hath dignified with more high-ſounding names. It is indeed apparent, that, without the aid of philological ſtudies, it is impoſſible, upon many occaſions, to develope the origin of nations; to trace their primary frame and conſtitution; to diſcover their manners, cuſtoms, laws, religion, government, language, progreſs in arts and arms; or to learn by what men and what meaſures the moſt celebrated ſtates of antiquity roſe into grandeur and conſideration. The ſtudy of hiſtory, ſo eminently uſeful to the legiſlator, the divine, the military man, the lawyer, the philoſopher, and the private gentleman who wiſhes to employ his learned leiſure in a manner honourable and improving to himſelf, and uſeful to his country, will contribute very little towards enlightening the mind without the aid of philological reſearches. For theſe reaſons we ſhall endeavour to explain the various branches of that uſeful ſcience as fully and as intelligibly as the nature of the preſent undertaking will permit.

Moſt of the branches of philology have been already canvaſſed under the various heads of CRITICISM, ETYMOLOGY, GRAMMAR, LANGUAGE, &c. There ſtill remains one part, which has been either ſlightly touched upon, or totally omitted, under the foregoing topics: we mean, the nature and complexion of moſt of the oriental tongues; as alſo ſome of the radical dialects of the languages of the weſt. As we would willingly gratify our readers of every deſcription to the utmoſt of our power, we ſhall endeavour in this place to communicate to them as much information upon that ſubject as the extent of our reading, and the limits preſcribed one ſingle article, will permit. 3 Object of this article.

Before we enter upon this ſubject, we muſt obſerve, that it is not our intention to fill our pages with a tedious, unintereſting, catalogue of barbarous languages, ſpoken by ſavage and inconſiderable tribes, of which little, or perhaps nothing, more is known than barely their names. Such an enumeration would ſwell the article without communicating one ſingle new idea to the reader's antecedent ſtock. We ſhall therefore confine our inquiries to ſuch languages as have been uſed by conſiderable ſtates and ſocieties, and which of conſequence have acquired a high degree of celebrity in the regions of the eaſt.

What was the antediluvian language, or whether it was divided into a variety of dialects as at this day, can only be determined by the rules of analogy; and theſe will lead us to believe, that whatever might have been the primitive language of mankind, if human nature was then conſtituted as it is at preſent, a great variety of dialects muſt of neceſſity have ſprung up in the ſpace of near 2000 years. If we adopt the Moſaic account of the antediluvian events, we muſt admit that the deſcendants of Cain for ſome ages lived ſeparated from thoſe of Seth. Their manner of life, their religious ceremonies, their laws, their form of government, were probably different, and theſe circumſtances would of courſe produce a variety in their language. The poſterity of Cain were an inventive race. They found out the art of metallurgy, muſic, and ſome think of weaving; and in all probability many other articles condu- 4 Variety of dialects before the deluge.

cive to the caſe and accommodation of life were the produce of their ingenuity. A people of this character muſt have paid no ſmall regard to their words and modes of expreſſion. Wherever muſic is cultivated, language will naturally be improved and refined. When new inventions are introduced, a new race of words and phraſes of neceſſity ſpring up, correſponding to the recent ſtock of ideas to be intimated. Beſides, among an inventive race of people, new vocables would be continually fabricated, in order to ſupply the deficiencies of the primitive language, which was probably ſcanty in words, and its phraſeology unpoliſhed. The Cainites, then, among their other improvements, cannot well be ſuppoſed to have neglected the cultivation of language.

5 eſpecially among the children of Cain.

Many conjectures have been hazarded both by ancient and modern authors with reſpect to the origin of writing; an art nearly connected with that of ſpeaking. According to Pliny *, "the Aſſyrian letters had always exiſted; ſome imagined that letters had been invented by the Egyptian Mercury; others aſcribed the honour of the invention to the Syrians." The truth ſeems to be, that letters were an antediluvian invention, preſerved among the Chaldeans or Aſſyrians, who were the immediate deſcendants of Noah, and inhabited thoſe very regions in the neighbourhood of which the ark reſted, and where that patriarch afterwards fixed his reſidence. This circumſtance, we think, affords a ſtrong preſumption that the uſe of letters was known before the deluge, and tranſmitted to the Aſſyrians and Chaldeans by Noah their progenitor, or at leaſt by their immediate anceſtors of his family. If, then, the art of writing was an antediluvian invention, we think that in all probability it originated among the poſterity of Cain.

* *Nat. Hiſt.* lib. vii. cap. 56.

6 Origin of writing.

The deſcendants of Seth, according to the oriental tradition, were chiefly addicted to agriculture and tending of cattle. They devoted a great part of their time to the exerciſes of piety and devotion. From this circumſtance they came to be diſtinguiſhed by the title of the (A) *ſons of God*. According to this deſcription, the Sethites were a ſimple (B), unimproved race of people till they mingled with the race of Cain; after which period they at once adopted the improvements and the vices of that wicked family.

It is not, however, probable, that all the deſcendants of Seth, without exception, mingled with the Cainites. That family of which Noah was deſcended had not incorporated with the race of Cain: it was, according to the ſacred hiſtorian, lineally deſcended from Seth, and had preſerved the worſhip of the true God, when, it is probable, the greateſt part of mankind had apoſtatiſed and become idolaters (C). Along with the true religion, the progenitors of Noah had preſerved that ſimplicity of manners and equability of character which had diſtinguiſhed their remote anceſtors. Agriculture and rearing cattle had been their favourite occupations. Accordingly we find, that the patriarch Noah, immediately "after the deluge," became a huſbandman, and "planted a vineyard." The choſen patriarchs, who doubtleſs imitated their pious anceſtors, were ſhepherds, and employed in rearing and tending cattle. Indeed there are ſtrong preſumptions that the Chaldeans, Aſſyrians, Syrians, Canaanites, and Arabians, in the earlieſt ages followed the ſame profeſſion.

From this deduction, we imagine it is at leaſt probable, that the anceſtors of Noah perſiſted in the obſervance of the ſame ſimplicity of manners which had been handed down from Adam to Seth, and from him to Enoch, Methuſelah, Lamech, and from this laſt to Noah. According both to ſcripture and tradition, innovations were the province of the Cainites, while the deſcendants of Seth adhered to the primitive and truly patriarchal inſtitutions.

If theſe premiſes are allowed the merit of probability, we may juſtly infer that the language of Noah, whatever it was, differed very little from that of Adam (D); and that if it is poſſible to aſcertain the language of the former, that of the latter will of courſe be diſcovered. We ſhall then proceed to throw together a few obſervations relating to the language of Noah, and leave our readers to judge for themſelves. We believe it will be ſuperfluous to ſuggeſt, that our intention in the courſe of this deduction, is, if poſſible, to trace the origin and antiquity of the Hebrew tongue; and to try to diſcover whether that language, or any of its ſiſter dialects, may claim the honour of being the original language of mankind.

7 The original language preſerved in the family from which Noah ſprung.

Whatever may have been the dialect of Noah and his family, that ſame dialect, according to the Moſaic account, muſt have obtained, without any alteration, till the era of the building of the tower of Babel.—Upon this occaſion a dreadful convulſion took place: the language of mankind was confounded, and men were *ſcattered abroad upon the face of all the earth.*

How far this cataſtrophe (E) extended, is not the buſineſs of the preſent inquiry to determine. One thing is certain beyond all controverſy, namely, that the languages of all the nations which ſettled near the centre of population were but ſlightly affected by its influence. A very judicious writer has obſerved *, that 3000 years after, the inhabitants of thoſe countries exhibited a very ſtrong reſemblance of cognation, "in their *language*, manner

8 Confuſion at the tower of Babel.

* *Strabo.*

(A) From this paſſage (Gen. chap. vi. verſe 2.) miſunderſtood, originated the abſurd idea of the connection between angels and mortal women. See *Joſeph. Antiq. Jud.* lib. i. cap. 4. See *Euſeb. Chron.* lib. i. All the fathers of the church, almoſt without exception, adopted this fooliſh notion. See alſo *Philo-Jud.* p. 198. edit. Turn. Paris 1552.

(B) The orientals, however, affirm, that Seth, whom they call *Edris*, was the inventor of aſtronomy.

(C) We think it highly probable that idolatry was eſtabliſhed before the flood; becauſe it prevailed almoſt immediately after that cataſtrophe. See POLYTHEISM.

(D) For the firſt language communicated to Adam, ſee the article on LANGUAGE; alſo *Schuckford's Connect.* vol. i. lib. ii. p. 111. *et ſeq.*

(E) Joſephus and the fathers of the church tell us, that the number of languages produced by the confuſion of tongues was 72; but this is a mere rabbinical legend.

History of Language.

manner of living, and the lineaments of their bodies. At the same time he observes, that the resemblance in all those particulars was most remarkable among the inhabitants of Mesopotamia." This observation, with respect to language, will, we doubt not, be vouched by every one of our readers who has acquired even a superficial knowledge of the languages current in those quarters at a very early period.

It appears, then, that the languages of the Armenians, Syrians, Assyrians, Arabians, and probably of the Chanaanim, did not suffer materially by the confusion of tongues. This observation may, we imagine, be extended to many of the dialects (F) spoken by the people who settled in those countries not far distant from the region where the sacred historian has fixed the original seat of mankind after the deluge. The inference then is, that if Noah and his family spoke the original language of Adam, as they most probably did, the judgement which effected the confusion of tongues did not produce any considerable alteration in the language of such of the descendants of Noah as settled near the region where that patriarch had fixed his residence after he quitted the ark.

9 Only a part of mankind engaged in building the tower.

But supposing the changes of language produced by the catastrophe at the building of the tower as considerable as has ever been imagined, it does not, after all, appear certain, that all mankind, without exception, were engaged in this impious project. If this assertion should be well founded, the consequence will be, that there was a chosen race who did not engage in that enterprise. If there was such a family, society, or body of men, it will follow, that this family, society, &c. retained the language of its great ancestor without change or variation. That such a family did actually exist, is highly probable, for the following reasons.

1. We think there is reason to believe that Ham, upon the heavy curse denounced upon him by his father *, retired from his brethren, and fixed his residence elsewhere. Accordingly we find his descendants scattered far and wide, at a very great distance from the Gordyæan mountains, where the ark is generally supposed to have rested immediately after the flood. Some of them we find in Chaldæa, others in Arabia Felix, others in Ethiopia (G), others in Canaan, and others in Egypt; and, finally, multitudes scattered over all the coast of Africa. Between these countries were planted many colonies of Shemites, in Elam, Assyria, Syria, Arabia, &c. We find, at the same time, the descendants of Shem and Japhet settled, in a great degree, contiguous to each other. This dispersion of the Hamites, irregular as it is, can scarce, we think, have been accidental; it must have been owing to some uncommon cause, and none seems more probable than that assigned above. If, then, the descendants of Ham separated early, and took different routes, as from their posterior situations it appears they did, they could not all be present at the building of the tower.

* Gen. ix. 25.

10 and those not the descendants of Shem.

2. It is not probable that the descendants of Shem were engaged in this undertaking, since we find that they were not *scattered abroad upon the face of all the earth*. The children of Shem were † Elam, Ashur, Arphaxad, Lud, and Aram. Elam settled near the mouth of the river Tigris, in the country which, by the Gentile writers, was called *Elymais*. Above him, on the same river, lay the demesne of Ashur, on the western side. In like manner, upon the same river, above him, was situated Aram, who possessed the country of Aramea; and opposite to him was Arphaxad, or Arbaces, or Arbaches, and his country was denominated *Arphachites*. Lud, as some think, settled in Lydia, among the sons of Japhet; but this opinion seems to be without foundation (H). Here, then, there is a dispersion, but such as must have originated from the nature of the thing. The four, or rather the five brothers, all settled contiguous, without being *scattered abroad upon the face of the whole earth*. Besides, there was no confusion of language among these tribes: they continued to use one and the same *lip* through many succeeding generations.

† Chap. x. verse 22.

11 The language of Adam preserved in the family of Shem.

From these circumstances it appears that the posterity of Shem were not involved in the guilt of the builders of the tower, and of consequence did not undergo their punishment. If then the language of the Shemites was not confounded upon the erection of the tower, the presumption is, that they retained the language of Noah, which, in all probability, was that of Adam. Some dialectical differences would in process of time creep in, but the radical fabric of the language would remain unaltered.

3. The posterity of Shem appear in general to have cultivated the pastoral life. They imitated the style of living adopted by the antediluvian posterity of Seth. No sooner had Noah descended from the ark, than he became *Ish ha Adamah*, a man of the earth; that is, a husbandman, and planted a vineyard. We find that some ages after, Laban the Syrian had flocks and herds; and that the chief wealth of the patriarch Abraham and his children consisted in their flocks and herds. Even his Gentile descendants, the Ishmaelites and Midianites, seem to have followed the same occupation. But people of this profession are seldom given to changes: their wants are few, and of consequence they are under few or

(F) The language of the Medes, Persians, Phœnicians, and Egyptians, very much resembled each other in their original complexion; and all had a strong affinity to the Hebrew, Chaldean, Syriac, &c. See Walton's *Proleg.*; Gale's *Court of the Gent.* vol. i. lib. i. ch. 11. p. 70. *et seq.*; Boch. *Phalec* and *Chanaan*, *pass.* To these we may add the Greek language, as will appear more fully below.

(G) Josephus informs us, that all the nations of Asia called the Ethiopians *Cushim*, lib. i. cap. 7.

(H) The ancient name of Lydia was *Mæonia*. See Strabo *Casaub.* lib. xiii. p. 586. chap. 7. *Rhod.* 577. The Lydians were celebrated for inventing games; on which account they were nicknamed by the Æolian Greeks Λυδοι, *Lydi* or *Ludi*, from the Hebrew word *luz*, *ludere*, *illudere*, *deridere*. We find (Ezek. chap. xxvii. ver. 10.) the men of Elam and the men of Lud joined in the defence of Tyre; which seems to intimate, that the Elamites and Ludim were neighbours. If this was actually the case, then Lud settled in the same quarter with his brothers.

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or no temptations to deviate from the beaten track. This circumſtance renders it probable, that the language of Noah, the ſame with that of Adam, was preſerved with little variation among the deſcendants of Arphaxad down to Abraham.

12 down to Abraham.

We have obſerved above, that Ham, upon the curſe denounced againſt him by his father, very probably left the ſociety of his other brothers, and emigrated elſewhere, as Cain had done in the antediluvian world. There is a tradition ſtill current in the Eaſt, and which was adopted by many of the Chriſtian fathers (I), that Noah, in the 930th year of his life, by divine appointment, did, in the moſt formal manner, divide the whole terraqueous globe among his three ſons, obliging them to take an oath that they would ſtand by the deciſion. Upon this happened a migration at the birth of Peleg, that is, about three centuries after the flood. It is affirmed that Nimrod the arch-rebel diſregarded this partition, and encroached upon the territory of Aſhur, which occaſioned the firſt war after the flood.

The Greeks had acquired ſome idea of this partition, which they ſuppoſed to have been between Jupiter ‡, Neptune, and Pluto. Plato ſeems to have heard of it (K): "For (ſays he) the gods of old obtained the dominion of the whole earth, according to their different allotments. This was effected without any contention, for they took poſſeſſion of their ſeveral provinces in a fair and amicable way, by lot." Joſephus §, in his account of the diſperſion of mankind, plainly inſinuates a divine deſtination; and Philo-Judæus (L) was of the ſame opinion before him.

‡ *Callimach. Hym. Hom. Iliad*, lib. xv.

§ *Ant. Jud.* lib. 1. c. 5.

In conſequence of this arrangement, the ſons of Shem poſſeſſed themſelves of the countries mentioned in the preceding pages: the poſterity of Japhet had ſpread themſelves towards the north and weſt; but the Hamites, who had ſeparated from their brethren in conſequence of the curſe, not chooſing to retire to their quarters, which were indeed very diſtant from the place where the ark reſted, ſeized upon the land of Canaan (M). Perhaps, too, it might be ſuggeſted by ſome malicious ſpirits, that the aged patriarch was dealing partially when he aſſigned Ham and his poſterity a quarter of the world to inhabit not only remote from the centre of population, but likewiſe ſequeſtered from the reſt of mankind (N).

Be that as it may, the children of Ham removed eaſtward, and at length deſcending from the Carduchean or Gordyæan mountains, directed their courſe weſtward, and arrived at the plains of Shinar, which had been poſſeſſed by the Aſhurim ever ſince the era of the firſt migration at the birth of Peleg. The ſacred hiſtorian informs us, that the whole *earth* "was of one language and of one ſpeech;" that in journeying from the eaſt, they lighted upon the plain of Shinar, and dwelt there. In this paſſage we find no particular people ſpecified; but as we find Nimrod, one of the deſcendants of Ham, ſettled in that country, we are ſure that they were the offspring of that patriarch. It would not, we think, be eaſy to aſſign a reaſon how one branch of the family of Ham came to plant itſelf in the midſt of the ſons of Shem by any other means but by violence.

13 The tower of Babel built by the children of Ham.

It is indeed generally ſuppoſed, that Nimrod, at the head of a body of the children of Ham, made war upon Aſhur, and drove him out of the country of Shinar; and there laid the foundation of that kingdom, the beginning of which was Babel: that this chief, ſupported by all the Cuſhites, and a great number of apoſtates from the families of Shem and Japhet who had joined him, refuſed to ſubmit to the divine ordinance by the mouth of Noah, with reſpect to the partition of the earth; and that he and his adherents were the people who erected the celebrated tower, in conſequence of a reſolution which they had formed to keep together, without repairing to the quarters aſſigned them by the determination of heaven. This was the crime which brought down the judgment of the Almighty upon them, by which they were *ſcattered abroad upon the face of all the earth.* The main body of the children of Shem and Japhet were not engaged in this impious undertaking; their language, therefore, was not confounded, nor were they themſelves ſcattered abroad. Their habitations were contiguous; thoſe of the Shemites towards the centre of Aſia; the dwellings of Japhet were extended towards the north and north-weſt; and the languages of both theſe families continued for many ages without the leaſt variation, except what time, climate, laws, religion, new inventions, arts, ſciences, and commerce, &c. will produce in every tongue in a ſucceſſion of years.

The general opinion then was, that none but the progeny of Ham and their aſſociates were preſent at the building of the tower, and that they only ſuffered by the judgment (O) conſequent upon that attempt. There are

(I) *Epiph.* vol. i. p. 5. *ibid.* p. 709. where our learned readers will obſerve ſome palpable errors about *Rhinocorura*, &c. Euſeb. *Chron.* p. 10. Syncellus, p. 89. Cedrenus *Chron. Paſch.* &c.

(K) Critias, vol. iii. page 109. *Serr.* Apollodorus mentions a time when the gods reſpectively ſelected particular cities and regions, which they were to take under their peculiar protection.

(L) Lib. x. p. 236. Turn. Paris 1552. We have a plain alluſion to this diſtribution (Deut. ch. xxxii. ver. 7.). "When the moſt High divided to the nations their inheritance, when he ſeparated the ſons of Adam, he ſet the bounds of the people, according to the number of the children of Iſrael; for the Lord's portion is his people; Jacob is the lot of his inheritance." From this paſſage it appears, that the whole was arranged by the appointment of God, and that the land of Canaan was expreſly reſerved for the children of Iſrael. St Paul, Acts ch. xvii. ver. 16. ſpeaks of this divine arrangement, "God made of one blood all nations of men, for to dwell on all the face of the earth; and determined the bounds of their habitation."

(M) The ark, according to the moſt probable accounts, reſted upon Mount Ararat in Armenia.

(N) We think it by no means improbable that Noah, well knowing the wickedneſs of the family of Ham, and eſpecially their inclination to the idolatry of the antediluvians, might actually intend to ſeparate them from the reſt of mankind.

(O) Some learned men have imagined that this confuſion of language, which the Hebrew calls of *Lip*, was only a

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are even among the Pagans ſome alluſions to the diviſion of the world among the three ſons of Noah. Many of the learned have imagined that this patriarch was Saturn; and that his three ſons were Jupiter, Neptune, and Pluto, as has been obſerved above.

* *Euſeb. Chron.*

Beroſus*, in his hiſtory of the Babylonians, informs us, that Noah, at the foot of Mount Baris or Luban, where the ark reſted, gave his children their laſt inſtructions, and then vaniſhed out of ſight. It is now generally believed that the Xiſuthrus of Beroſus was Noah.

† *Euſeb. Prep. Ev. lib.* 9.

Eupolemus†, another heathen writer, tells us, "that the city Babel was firſt founded, and afterwards the celebrated tower; both which were built by ſome of thoſe people who eſcaped the deluge. They were the ſame with thoſe who in after-times were exhibited under the name of *giants*. The tower was at length ruined by the hand of the Almighty, and thoſe giants were ſcattered over the whole earth." This quotation plainly intimates, that according to the opinion of the author, only the raſcally mob of the Hamites, and their apoſtate aſſociates, were engaged in this daring enterpriſe.

Indeed it can never be ſuppoſed that Shem, if he was alive at that period, as he certainly was, would co-operate in ſuch an abſurd and impious undertaking. That devout patriarch, we think, would rather employ his influence and authority to divert his deſcendants from an attempt which he knew was undertaken in contradiction to an expreſs ordinance of Heaven: and it is ſurely very little probable that Elam, Aſhur, Arphaxad, and Aram, would join that impious confederacy, in oppoſition to the remonſtrances of their father.

The building of the tower, according to the moſt probable chronology, was undertaken at a period ſo late, that *all mankind* could not poſſibly have concurred in the enterpriſe.

‡ *Epiph. Hæreſ. lib.* 1.

Many of the fathers were of opinion, that Noah ſettled in Armenia, the country where the ark reſted; and that his deſcendants did not leave that region for five generations‡, during the ſpace of 659 years. By this period the human race muſt have been ſo amazingly multiplied, that the plains of Shinar could not have contained them. According to the Samaritan Pentateuch, and the Septuagint verſion, Peleg was born in the 134th year of his father Eber. Even admitting the vulgar opinion, that the tower was begun to be built, and the diſperſion conſequent upon that event to have taken place at this era, the human race would have been by much too numerous to have univerſally concurred in one deſign.

From theſe circumſtances, we hope it appears that the whole maſs of mankind was not engaged in building the tower; that the language of all the human race was not confounded upon that occaſion; and that the diſperſion reached only to a combination of Hamites, and of the moſt profligate part of the two other families, who had joined their wicked confederacy.

14 Therefore the original language preſerved in the other two families.

We have purſued this argument to conſiderable length, becauſe ſome have inferred, from the difference in languages exiſting at this day, that mankind cannot have ſprung from two individuals; becauſe from the connection ſtill exiſting among languages, ſome have been bold enough to queſtion the fact, though plainly recorded in ſacred hiſtory; and laſtly, becauſe we imagine that ſome of our readers, who do not pretend to peruſe the writings of the learned, may be gratified by ſeeing the various opinions reſpecting the confuſion of tongues, and the diſperſion of mankind, collected into one maſs, equally brief, we hope, and intelligible; and this view of theſe opinions, with the foundations on which they reſpectively reſt, we think may ſuffice to prove, that the language of Noah was for ſome ages preſerved unmixed among the deſcendants of both Shem and Japhet.

To gratify ſtill farther ſuch of our curious readers as may not have acceſs to more ample information, we ſhall in this place exhibit a brief detail of the circumſtances which attended this fatal attempt. The people engaged in it have been held up as a profligate race. The Almighty himſelf denominates them "*the children of men*," which is the very appellation by which the antediluvian ſinners were characteriſed; *the ſons of God ſaw the daughters of men*, &c. Their deſign in raiſing this edifice was "*to make them a name, and to prevent their being ſcattered abroad upon the face of the whole earth**."

* *Gen. chap.* xi.

Whatever reſolution the reſt of mankind might take, they had determined to maintain themſelves on that ſpot. The tower was intended as a centre of union, and perhaps as a fortreſs of defence. Such a ſtupendous fabric, they imagined, would immortalize their memory, and tranſmit the name of their confederacy with eclat (P) to future ages. This deſign plainly intimates, that there was only a party concerned in the undertaking, ſince, had all mankind been engaged in it, the purpoſe would have been fooliſh and futile. Again, they intended, by making themſelves *a name*, to prevent their being ſcattered abroad upon the face of the earth. This was an act of rebellion in direct contradiction to the divine appointment, which conſtituted their crime, and brought down the judgment of Heaven upon their guilty heads. The conſequence of the confuſion of languages was, that the projectors left off to build (Q), and were actually ſcattered abroad, contrary to their intention.

15 Pagan tradition concerning the tower of Babel.

Abydenus, in his Aſſyrian Annals, records, that the (R) "tower was carried up to heaven; but that the gods

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a temporary failure of pronunciation, which was afterwards removed. This they are led to conclude, from the agreement of the languages of theſe people in after times.

(P) Many fooliſh and abſurd notions have been entertained concerning this ſtructure. Some have imagined that they meant to take ſhelter there in caſe of a ſecond deluge; others, that it was intended for idolatrous purpoſes; others, that it was to be employed as an obſervatory. Its dimenſions have likewiſe been moſt extravagantly magnified. Indeed Strabo, lib. 16. mentions a tower of immenſe ſize remaining at Babylon in his time, the dimenſions of which were a ſtadium every way. This, however, ſeems to have been the remains of the temple of Bel or Belus.

(Q) For a deſcription of the tower, ſee the article Babel.

(R) See the Greek original of this quotation, Euſeb. Chron. lib. 1. page 13.

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gods ruined it by storms and whirlwinds, and overthrew it upon the heads of those who were employed in the work, and that the ruins of it were called *Babylon*. Before this there was but one language subsisting among men: but now there arose πολυθρουν φωνην, *a manifold speech*; and he adds, that a war soon after broke out between (S) Titan and Cronus." (T) The Sybilline oracles give much the same account of this early and important transaction.

"Justin * informs us, that the Phœnicians who built Tyre were driven from Assyria by an earthquake. These Phœnicians were the descendants of Mizraim the youngest son of Ham; and were, we think, confederates in building the tower, and were driven away by the catastrophe that ensued. Many other allusions to the dispersion of this branch of the family occur in Pagan authors, which the limits to be observed in an inquiry of this nature oblige us to omit. Upon the whole, we think it probable that the country of Shinar lay desolate for some time after this revolution; for the dread of the judgment inflicted upon the original inhabitants would deter men from settling in that inauspicious region. At last, however, a new colony arrived, and Babel, or Babylon, became the capital of a flourishing kingdom.

* *Philip.* lib. 18. cap. 3.

Our readers, we believe, will expect that we should say something of Nimrod the mighty hunter, who is generally thought to have been deeply concerned in the transactions of this period. According to most authors, both ancient and modern, this patriarch was the leader of the confederates who erected the tower, and the chief instigator to that enterprise. But if the tower was built at the birth of Pheleg, according to the Hebrew computation, that chief was † either a child, or rather not born at that period (U). The Seventy have pronounced him a giant, as well as a huntsman. They have translated the Hebrew word *gebur*, which generally signifies *strong*, *mighty*, by the word γιγας, *giant*; an idea which we imagine those translators borrowed from the Greeks. The antediluvian giants are called *Nephelim* and *Rephaim*, but never *Geburim*. The Rabbinical writers, who justly hated the Babylonians, readily adopted this idea (X); and the fathers of the church, and the Byzantine historians, have universally followed them. He has been called *Nimrod*, *Nebrod*, *Nymbroth*, *Nebroth*, and *Nebris*. Not a few have made him the first *Bacchus*, and compounded his name of *Bar*, a son, and *Cush*, that is, the son of *Cush*. Some have imagined that he was the Orion of the Pagans, whose shade is so nobly described by Homer ‡. But the etymology of this last name implies something (Y) honourable, and very unsuitable to the idea of the *tyrant Nimrod*. It must be observed, however, that we find nothing in Scripture to warrant the supposition of his having been a tyrant; so far from it, that (Z) some have deemed him a benefactor to mankind. See NIMROD.

† *Bochar. Phaleg.* lib. 1. cap. 10.

‡ *Odyss.* l. 1. verse 571.

The beginning of this prince's kingdom was Babel. Eusebius gives us first * a catalogue of six kings of the Chaldæans, and then another of five kings of Arabian extraction, who reigned in Chaldæa after them. This might naturally enough happen, since it appears that the inhabitants of those parts of Arabia which are adjacent to Chaldea were actually Cushites, of the † same family with the Babylonians.

* *Chron.* lib. 1. page 14.

† Gen. x. Ezek. xxvii.

The Cushites, however, were at last subdued, perhaps partly expelled Chaldea by the *Chasidim*, who probably claimed that territory as the patrimony of their progenitors. That the Chasidim were neither *Cushites*, nor indeed *Hamites*, is obvious from the name. The Hebrews, and indeed all the Orientals ‡, denominated both the people who inhabited the eastern coast of Arabia *Cushim*, and also the Ethiopians who sprung from the last-mentioned people. Had the later inhabitants of Chaldea been the descendants of Cush, the Jewish writers would have called them *Cushim*. We find they called the Phœnicians *Channanim*, the Syrians *Aramim*, the Egyptians *Mizraim*, the Greeks *Jonim*, &c. The Chasidim, therefore, or modern inhabitants of Chaldea, were positively descended of one Chesed or Chased; but who this family-chief was, it is not easy to determine. The only person of that name whom we meet with in early times is the fourth son of Nahor §, the brother of Abraham; and some have been of opinion that the Chaldeans were the progeny of this same Chesed. This appears to us highly probable, because both Abram and Nahor were ‖ natives of *Ur* of the Chasidim. The former, we know, in consequence of the divine command, removed to *Haran*, afterwards *Charræ*; but the latter remained in *Ur*, where his family multiplied, and, in process of time, became masters of the country which they called the land of the Chasidim, from *Chesed* or *Chased*, the name of their ancestor. This account is the more probable, as we find the other branches of Nahor's family settled in the same neighbourhood (A).

‡ *Joseph.* Ant. lib. 1. cap. 6.

§ Gen. chap. xxii. verse 22.

‖ Gen. chap. xi. verse 28.

16 Origin of the name Chaldæi.

How the Greeks came to denominate these people Χαλδαιοι, *Chaldæi*, is a question rather difficult to be resolved; but we know that they always affected to distinguish people and places by names derived from their own language. They knew a rugged, erratic nation (B) on

(S) This war was probably carried on between the leaders of the Hamites and Ashur upon their invasion.

(T) Theoph. ad Antol. lib. ii. page 107. ed. Paris 1636.

(U) Gen. chap. x. verse 8, 9. "This man began to be a *giant* upon the earth; he was the giant hunter before the Lord God.—As Nymbrod the *giant* hunter before the Lord."

(X) See Mr Bryant's Analysis, vol. iii. page 38. et seq.

(Y) Orion is compounded of the Hebrew *Or*, "light," and *ion*, "one of the names of the sun;" and Orion was probably one of the names of that luminary.

(Z) See Shuckford's Connect. vol. i. lib. 3. page 179, 180. Also the authors of the Univer. Hist. vol. i.

(A) Huz gave name to the country of Job; Elihu, one of Job's friends, was a Buzite of the kindred of Ram or Aram, another of the sons of Nahor. Aram, whose posterity planted Syria cava, was the grandson of Nahor by Kemuel. Hence it appears probable that Job himself was a descendant of Nahor by Huz his first born.

(B) See Eustat. in Dion. Perieg. ver. 768. Strabo. lib. xii. page 543. Casaub. As the Chalybes were famous for manufacturing iron, so were they celebrated for making the choicest pieces of armour. They excelled in making

χλιδωνοι,

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on the banks of the river Thermodoon, in the territory of Pontus, bordering on Armenia the Less. These, in ancient times, were called *Alybes* or *Chalybes*, because they were much employed in forging and polishing iron. Their neighbours, at length, gave them the name of *Chald* or *Caled*, which imports, in the Armenian dialect, *fierce, hardy, robust*. This title the Greeks adopted, and out of it formed the word Χαλδαιοι, "Chaldeans."

The Mosaic history informs us (c), that Ashur went out of *that land* (Shinar), and built Nineveh and several other considerable cities. One of the successors of Ashur was the celebrated Ninus, who first broke the peace of the world *, made war upon his neighbours, and obliged them by force of arms to become his subjects, and pay tribute. Some authors make him the immediate successor of Ashur, and the builder of Nineveh. This we think is not probable; Eusebius, as we have observed above, gives a list of six Arabian princes who reigned in Babylon. These we take to have been the immediate successors of Nimrod, called *Arabians*; because these people were Cushites. Ninus might be reputed the first king of the Assyrians, because he figured beyond his predecessors; and he might pass for the builder of Nineveh, because he greatly enlarged and beautified that city. We therefore imagine, that Ninus was the fifth or sixth in succession after Ashur.

Ninus, according to Diodorus Siculus †, made an alliance with Ariæus king of the Arabians, and conquered the Babylonians. This event, in our opinion, put an end to the empire of the Hamites or Cushim in Shinar or Babylonia. The author observes, that the Babylon which figured afterwards did not then exist. This fact is confirmed by the prophet Isaiah ‡: "Behold the land of the Chasdim; this people was not till Ashur founded it for them that dwell in the wilderness. They set up the towers thereof, &c." After Babylonia was subdued by the Assyrians under Ninus, the capital was either destroyed by that conqueror or deserted by the inhabitants. At length it was re-edified by some one or other of the Assyrian monarchs, who collected the roving Chasidim, and obliged them to settle in the new city. These were subject to the Assyrian empire till the reign of Sardanapalus, when both the Medes and Babylonians rebelled against that effeminate prince.

The Chasidim were celebrated by all antiquity for their proficiency in astronomy, astrology, magic, and curious sciences. Ur or Orchoe (D) was a kind of university for those branches of learning. Such was their reputation in those studies, that over a great part of Asia and Europe a Chaldean and an astrologer were synonymous terms. These sciences, according to the tradition of the Orientals, had been invented by Seth, whom they call *Edris*; and had been cultivated by his descendants downward to Noah, by whom they were transmitted to Shem, who conveyed them to Arphaxad and his posterity.

To us it appears probable, that the religious sentiments transmitted from Noah through the line of Shem, were kept alive in the family of Arphaxad, and so handed down to the families of Serug, Nahor, Terah, Abram, Nahor II. and Haran, &c. The Jewish rabbis, and all the Persian and Mahomedan writers, make Abraham contemporary with Nimrod; who, say they, persecuted him most cruelly for adhering to the true religion. That these two patriarchs were contemporary is very improbable, since Nimrod was the third generation after Noah, and Abram the tenth. Abram has been invested by the rabbinical writers with every department of learning. According to them, he transported from Charræ into Chanaan and Egypt, astronomy, astrology, mathematics, geography, magic, alphabetical writing, &c. &c. 17

Legendary tales concerning Abraham.

After the Babylonish captivity, when the Jews were dispersed over all the east, and began to make *proselytes of the gate* among the Pagans, wonderful things were reported of Abram with respect to his acquirements in human erudition, as well as his supereminence in virtue and piety. These legendary tales were believed by the proselytes, and by them retailed to their connections and acquaintances. But certainly the holy man either was not deeply versed in human sciences, or did not deem them of importance enough to be communicated to his posterity; since the Jews are, on all hands, acknowledged to have made little progress in these improvements. To think of raising the fame of Abraham, by classing him with the philosophers, betrays an extreme defect in judgment. He is entitled to praise of a higher kind; for he excelled in piety, was the father of the faithful, the root of the Messiah, and the friend of God. Before these, all other titles vanish away. Such of our readers, however, as have leisure enough, and at the same time learning enough to enable them to consult the rabbinical legends, will be furnished with a full and ample detail

* Justin. lib. i. cap. i.

† Lib. ii.

‡ Ch. xxiii. verse 13.

κλιβανοι, or coats of mail, or brigandines used by the bravest of the Persian horsemen. Bochart Phaleg. lib. iii. cap. 12. and 13. has proved that the word *Cheliba* signifies "scales of brass or steel." From the word *Cheliba*, the Greeks formed their Χαλυβεις, *Chalybes*. Xenoph. Cyrop. lib. iii. p. 43. Steph. represents the Chaldeans, who inhabited a mountainous country bordering upon Armenia, as a very fierce warlike people. Ib. page 107. we have an example of their rapacious character. Id. ib. lib. iv. p. 192. Hen. Steph. we have an account of their bravery and of their arms. Another instance of their rapacity occurs in their plundering the cattle of Job.

(c) A dispute has arisen about the sense of verse 10. chap. x. Out of that land went forth Ashur, and builded Nineveh. Some approve our translation, which we think is just; others, considering that the inspired writer had been speaking of Nimrod and the beginning of his kingdom, are of opinion that it should be translated, And out of this land *He* (that is Nimrod) went into Ashur and builded Nineveh. This they make a military expedition, and a violent irruption into the territory of Ashur.

(D) Ur or Orchoe was situated between Nisibis and Corduena. See Ammianus Marcel. Expeditio Juliana, lib. xv. It lay not far from the river Tigris. Strabo, lib. xvi. p. 739, tells us that the Chaldean philosophers were divided into different sects, the Orchehi, the Borsippeni, and several others. Diod. Sicul. likewise, lib. ii. p. 82. Steph. gives an exact detail of the functions, profession, and establishment of the Chaldeans, to which we must refer our curious readers.

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tail of his imaginary exploits and adventures. Others, who are either not willing or not qualified to peruse the writings of the rabbins, may consult Dr Hyde * de Relig. vet. Perf. and the authors of the Universal History †, where they will find materials sufficient to gratify their curiosity. We shall only observe, in addition to what we have already said, that the Persians, Chaldeans, and Arabians, pretended that their religion was that of Abraham; that honourable mention is made of him in the Koran; and that the name of Abraham or Ibrahim was celebrated over all the east. See ABRAHAM.

* Chap. ii.

† Vol. I.

IN the progress of this disquisition, we have seen that the language of Noah was, in all probability, the same or nearly the same with that of Adam. Additions and improvements might be introduced, but still the radical stamina of the language remained unchanged. It has likewise, we hope, appeared, that the confusion of language at the building of the tower of Babel was only partial, and affected none but the rebellious crew of the race of Ham, and the apostate part of the families of Shem and Japhet. We have concluded, that the main body of the race of Shem, at least, were neither dispersed nor their language confounded; and that consequently the descendants of that patriarch continued to speak their paternal dialect or the uncorrupted language of Noah. To these arguments we may take the liberty to add another, which is, that in all probability the worship of the true God was preserved in the line of Arphaxad, after the generality of the other sects had lapsed into idolatry. Out of this family Abraham was taken, in whose line the true religion was to be preserved. Whether Abraham was an idolater when he dwelt in Chaldea, the Scripture does not inform us, though it seems to be evident that his father was. One thing, however, is certain, namely, that Jehovah (E) appeared to him, and pronounced a blessing upon him before he left Ur of the Chaldees. This circumstance no doubt indicates, that this patriarch had made uncommon advances in piety and virtue, even prior to his emigration. The progenitors of his family had been distinguished by adhering to the true religion. About this time, however, they began to degenerate, and to adopt the Zabiism of their apostate neighbours. It was then that Abraham was commanded by Heaven to "leave his kindred and his father's house, and to travel into a land which was to be shown him." The Almighty intended that the true religion should be preserved in his line, and therefore removed him from a country and kindred, by the influence of whose bad example his religious principles might be endangered. His family had only of late apostatized; till that period they had preserved both the language and religion of their venerable ancestors.

18 The Hebrew and Chaldean originally the same, and the first language spoken on earth.

But however much Abraham might differ from the other branches of his family in his religious sentiments, his language was certainly in unison with theirs. The consequence of this unquestionable position is, that the language which he carried with him into Chanaan was exactly the same with that of his family which he relinquished when he began his peregrinations. But if this be true, it will follow, that the language afterwards denominated Hebrew, and that of the Chasidim or Chaldeans, were originally one and the same. This position, we think, will not be controverted. There is then an end of the dispute concerning the original language of mankind. We have advanced some presumptive proofs in the preceding pages, that the language of Adam was transmitted to Noah, and that the dialect of the latter was preserved in the line of Arphaxad downwards to the family of Abraham: and it now appears that the Hebrew and Chaldean were originally spoken by the same family, and of course were the same between themselves, and were actually the first language upon earth, according to the Mosaic history. Numberless additions, alterations, improvements, we acknowledge, were introduced in the course of 2000 years; but still the original stamina of the language were unchanged. Our readers will please to observe that the Orientals are not a people *given to change*; and that this character, in the earliest ages, was still more prevalent than at present. This assertion, we presume, needs no proof.

In confirmation of these presumptive arguments, we may add the popular one which is commonly urged upon this occasion, viz. that the names of antediluvian persons and places mentioned by the sacred historian, are generally of Hebrew original, and significant in that language. Some of them, we acknowledge, are not so; but in this case it ought to be remembered, that a very small part of that language now exists, and that probably the radicals from which these words are descended are among the number of those which have long been lost.

SECT. I. *The Hebrew Language.*

19 Characteristics of the Hebrew language.

HAVING thus proved the priority of the Hebrew to every other language that has been spoken by men, we shall now proceed to consider its nature and genius; from which it will appear still more evidently to be an original language, neither improved nor debased by foreign idioms. The words of which it is composed are short, and admit of very little flexion. The names of places are descriptive of their nature, situation, accidental circumstances, &c. Its compounds are few, and inartificially joined together. In it we find few of those artificial affixes which distinguish the other cognate dialects; such as the Chaldean, Syrian, Arabian, Phœnician, &c. We find in it no traces of improvement from the age of Moses to the era of the Babylonish captivity. The age of David and Solomon was the golden period of the Hebrew tongue; and yet, in our opinion, it would puzzle a critic of the nicest acumen to discover much improvement even during that happy era. In fact, the Jews were by no means an inventive people. We hear nothing of their progress in literary pursuits; nor do they seem to have been industrious in borrowing from their neighbours. The laws and statutes communicated by Moses were the principal objects of their studies. These they were commanded to contemplate day and night; and in them they were to place their chief delight. The consequence of this command was, that little or no regard could be paid to taste, or any other subject

(E) Compare Gen. chap. xii. ver. 2. with Acts, chap. vii. ver. 4.

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subject of philosophical investigation. Every unimproved language abounds in figurative expressions borrowed from sensible objects. This is in a peculiar manner the characteristic of the language in question; of which it would be superfluous to produce instances, as the fact must be obvious even to the attentive reader of the English Bible.

In the course of this argument, we think it ought to be observed, and we deem it an observation of the greatest importance, that if we compare the other languages which have claimed the prize of originality from the Hebrew with that dialect, we shall quickly be convinced that the latter has a just title to the preference. The writers who have treated this subject, generally bring into competition the Hebrew, Chaldean, Syrian, and Arabian. Some one or other of these has commonly been thought the original language of mankind. The arguments for the Syrian and Arabian are altogether futile. The numerous improvements superinduced upon these languages, evidently prove that they could not have been the original language. In all cognate dialects, etymologists hold it as a maxim, that the least improved is likely to be the most ancient.

We have observed above, that the language of Abraham and that of the Chesedim or Chaldeans were originally the same; and we are persuaded, that if an able critic should take the pains to examine strictly these two languages, and to take from each what may reasonably be supposed to have been improvements or additions since the age of Abraham, he will find intrinsic evidence sufficient to convince him of the truth of this position. There appear still in the Chaldean tongue great numbers of (F) words the same with the Hebrew, perhaps as many as mankind had occasion for in the most early ages; and much greater numbers would probably be found if both languages had come down to us entire.

20
How it was changed into what is called the Chaldean.

The construction of the two languages is indeed somewhat different; but this difference arises chiefly from the superior improvement of the Chaldean. While the Hebrew language was in a manner stationary, the Chaldean underwent progressive improvements; was mellowed by antitheses, rendered sonorous by the disposition of vocal sounds, acquired a copiousness by compounds, and a majesty by affixes and prefixes, &c. In process of time, however, the difference became so great, that the Israelites did not understand the Chaldean language at the era of the Babylonish captivity. This much the prophet* intimates, when he promises the pious Jews protection "from a fierce people; a people of a deeper speech than they could perceive; of a stammering tongue, that they could not understand."

The priority of the Chaldean tongue is indeed contended for by very learned writers. Camden † calls it the mother of all languages; and most of the fathers were of the same opinion. Amira ‡ has made a collection of arguments, not inconsiderable, in favour of it; and Myriceus § after him, did the same. Erpenius ‖, in his Oration for the Hebrew tongue, thought the argument for it and the Chaldean so equal, that he did not choose to take upon him to determine the question.

* Isaiah, ch. xxxiii. verse 19.

† *Brit.*

‡ *Præf. ad Gram. Syr.*

§ *Præf. ad Gram. Chald.*

‖ *Oratio de lingua Hebr. xii.*

Many circumstances, however, concur to make us assign the priority to the Hebrew, or rather to make us believe that it has suffered fewest of those changes to which every living tongue is more or less liable. If we strip this language of every thing obviously adventitious, we shall find it extremely simple and primitive.

21
Reasons for maintaining the priority of the Hebrew.

1. Every thing masoretical, supposing the vowels and points (G) essential, was certainly unknown in its original character. 2. All the prefixed and affixed letters were added time after time, to give more compass and precision to the language. 3. The various voices, moods, tenses, numbers, and persons of verbs, were posterior improvements; for in that tongue, nothing at first appeared but the indeclinable radix. 4. In the same manner, the few adjectives that occur in the language, and the numbers and regimen of nouns, were not from the beginning. 5. Most of the Hebrew nouns are derived from verbs; indeed many of them are written with the very same letters. This rule, however, is not general; for often verbs are derived from nouns, and even some from prepositions. 6. All the verbs of that language, at least all that originally belonged to it, uniformly consist of three letters, and seem to have been at first pronounced as monosyllables. If we anatomize the Hebrew language in this manner, we shall reduce it to very great simplicity; we shall confine it to a few names of things, persons, and actions; we shall make all its words monosyllables, and give it the true characters of an original language. If at the same time we reflect on the small number of (H) radical words in that dialect, we shall be more and more convinced of its originality.

It will not be expected that we should enter into a minute discussion of the grammatical peculiarities of this ancient language. For these we must refer our readers to the numerous and elaborate grammars of that tongue, which are everywhere easily to be found. We shall only make a few strictures, which naturally present themselves, before we dismiss the subject.

22
All languages in the east originally the same.

The generality of writers who have maintained the superior antiquity of the Hebrew language, have at the same time contended that all other languages of Asia, and most of those of Europe, have been derived from that tongue as their source and matrix. We, for our part, are of opinion, that perhaps all the languages in the eastern part of the globe were coeval with it, and were originally one and the same; and that the differences which afterwards distinguished them sprung from climate, caprice, inventions, religions, commerce, conquests,

(F) Most of the Chaldean names mentioned in Scripture are pure Hebrew words compounded; such as *Nebuchadnezzar*, *Nebuzaradan*, *Rabshakeh*, *Rabmag*, *Belshazzar*, *Rabsaris*, *Nahar*, *Malahtha*, *Phrat* or *Pharad*, *Barosus*, *Carchemish*, *Ur*, *Cutha*, Heb. *Cush*, &c. All these words, and a multitude of others which we could mention, approach so near the Hebrew dialect, that their original is discernible at first sight. Most of these are compounds, which the limits prescribed us will not allow us to decompound and explain.

(G) The futility of these points will be proved in the following part of this section.

(H) The radical words in the Hebrew language, as it now stands, are about 500.

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The Jewish rabbis have pretended to ascertain the number of languages generated by the vengeance of Heaven at the building of Babel. They tell us that mankind was divided into 70 nations and 70 languages, and that each of these nations had its tutelar or guardian angel. This fabulous legend is founded on the number of the progeny of Jacob at the time when that patriarch and his family went down into Egypt. Others attribute its origin to the number of the sons and grandsons of Noah, who are enumerated Gen. chap. x.

The fathers * of the church make the languages at the confusion to amount to 72; which number they complete by adding Cainan and Elishah, according to the Septuagint, who are not mentioned in the Hebrew text. This opinion, they think, is supported by the words of Moses, when he saith, that † "when the Most High divided to the nations their inheritance, when he separated the sons of Adam, he set the bounds of the people according to the number of the tribes of Israel." That is, say they, he divided them into 72 nations, which was the number of the children of Israel when they came into Egypt. The Targum of Ben-Uzziel plainly favours this interpretation; but the Jerusalem Targum intimates that the number of nations was only 12, according to the number of the tribes of Israel. This passage, however, seems to refer to the tribes of the Chanaanim; and imports, that the Almighty assigned to the different septs of that family such a tract of land as he knew would make a sufficient inheritance for the children of Israel †. Others have increased the different languages of the dispersion to 120; but the general opinion has fixed them to 70 or 72. Our readers need scarce be put in mind that these opinions are futile and absurd; neither founded in Scripture, profane history, or common sense. At the same time, it must not be omitted, that according to Horapollo §, the Egyptians held, that the world was divided into 72 habitable regions; and that, in consequence of this tradition, they made the cynocephalus the emblem of the world, because that in the space of 72 days that animal pines away and dies.

* *Clem. Alex. Strom. Euseb. Chron.* lib. i. *Epiphan. Haeres. August.* &c.

† Deut. chap. xxxii verse 8.

† *Pacanini Episcop. Bercun. apud Hieron. in Catalogo Episc.* 22.

§ 14. page 25. *Hoesch*

23
Origin of the name *Hebrew*.

It has been made a question, whether the Hebrew language was denominated from Heber the progenitor of Abraham, or from a word which in that tongue imports *over, beyond*. Most of the Christian fathers, prior to St Origen, believed that both the Gentile name *Hebrew*, and the name of the language, were derived from the name of the patriarch; but that learned man imagined, that Abraham was called the *Hebrew*, not because he was a descendant of Heber, but because he was a transfluvianus, or from beyond the river Euphrates. The learned Bochart * has strained hard to prove the former position; but to us his arguments do not appear decisive. We are rather inclined to believe, that Abraham was called *Chibri*, (Hebrew), from the situation of the country from which he emigrated when he came to the country of Chanaan; and that in process of time that word became a Gentile appellation, and was afterwards applied to his posterity (1) often by way of reproach, much in the same manner as we say a *Northlander*, a *Norman*, a *Tramontane*, &c.

* *Phaleg*, lib. i. c. 15.

Here we may be indulged an observation, namely, that Abraham, a Hebrew, lived among the Chaldeans, travelled among the Chanaanites, sojourned among the Philistines, lived some time in Egypt, and in all appearance conversed with all those nations without any apparent difficulty. This circumstance plainly proves, that all these nations at that time spoke nearly the same language. The nations had not yet begun to improve their respective dialects, nor to deviate in any great measure from the monosyllabic tongue of the Hebrews. With respect to the language of Chanaan, afterwards the Phœnician, its similarity to the Hebrew is obvious from the names of gods, men, cities, mountains, rivers, &c. which are the very same in both tongues, as might be shown in numberless cases, were this a proper place for etymological researches.

Before we dismiss this part of our subject, we would wish to gratify our unlearned readers with a brief account of the Hebrew letters, and of the Masoretical points which have been in a manner ingrafted on these letters. In the course of this deduction, we shall endeavour to follow such authors as are allowed to have handled that matter with the greatest acuteness, learning, and perspicuity. If, upon any occasion, we should be tempted to hazard a conjecture of our own, it is cheerfully submitted to the candour of the public.

Much has been written, and numberless hypotheses proposed, with a view to investigate the origin of *alphabetical writing*. To give even an abridged account of all these, would fill many volumes. The most plausible, in our opinion, is that which supposes that the primary characters employed by men were the figures of material objects, analogous to those of the Mexicans, so often mentioned by the authors who have written the history of that people at the era of the Spanish invasion of their country. As this plan was too much circumscribed to be generally useful, hieroglyphical figures were in process of time invented as subsidiaries to this contracted orthography. In this scheme, we imagine, the process was somewhat more extensive. A *lion* might be sketched, to import fierceness or valour; an *ox*, to denote strength; a *stag*, to signify swiftness; a *hare*, to intimate timorousness, &c.

24
Origin of alphabetic writing.

The next step in this process would naturally extend to

(1) The Egyptians might not eat bread with the Hebrews, for that is an abomination to the Egyptians. The Philistines (Samuel I. *pass.*) always call the Israelites *Hebrews* by way of reproach.

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to the inventing and appropriating of a few arbitrary characters, for representing abstract ideas, and other relations, which could not be well ascertained by the methods above mentioned. These arbitrary signs might readily acquire a currency by compact, as money and medals do over a great part of the world.—Upon this plan we imagine the ancient Chinese formed their language.

But neither the picture nor the hieroglyphic, nor the method of denoting *ideas* by arbitrary characters appropriated by compact, could ever have arrived at such perfection as to answer all the purposes of ideal communication. The grand desideratum then would be to fabricate characters to represent simple sounds, and to reduce these characters to so small a number as to be easily learned and preserved in the memory. In this attempt the Chinese have notoriously failed; their letters, or rather their characters, are so numerous, that few, if any, of their most learned and industrious authors, have been able to learn and retain the whole catalogue. Indeed those people are not able to conceive how any combinations of 20 or 30 characters should be competent to answer all the purposes of written language.

Many different nations have claimed the honour of this invention. The Greeks ascribed it to the Phœnicians; and consequently used the word φοινικιζειν *, *to act the Phœnician*, in the same sense with αναγινωσκειν, *to read*; and consequently the poet † ascribes the invention to the same ingenious people. The Greeks borrowed their letters from the Phœnicians, and of course looked up to them as the inventors.

* *Hesych.*

† *Lucan.*

Others have attributed the invention to the Egyptians. That people ascribed every useful and ingenious invention to their Thyoth, or Mercury Trismegistus. Plato seems to have believed this tradition (K), and pretends to record a dispute between the king of Egypt that then reigned and this personage, with respect to the influence that the art of alphabetic writing might possibly have upon the improvements of mankind in science and liberal arts. Diodorus the Sicilian ‡ gives a similar history of the same invention, but carries it back to the reign of Osiris.

‡ *Bibl.* lib. i. page 10. Steph.

Pliny informs us §, that Gellius attributed letters to the same Egyptian Mercury, and others to the Syrians; but that for "his part, he thought that the Assyrian letters were eternal." That learned Roman then imagined, that the Assyrian letters had existed at a period prior to all the records of history; which was in fact the case. By the Assyrian letters, he must mean the Chaldaic, and by the Syrian probably the Hebrew. The earliest Greek historians generally confound the Jews with the Syrians. Herodotus, enumerating the people who had ‖ learned circumcision from the Egyptians, mentions the Syrians of Palestine; and elsewhere he tells us, that Necho * beat the Syrians, and took Cadytis, a large and populous city belonging to that people. Hence it is evident that the Syrian alphabet, or the Syrian letters, were the same with the Hebrew. That the Assyrian or Chaldaic and Hebrew languages were the same, has, we hope, been fully proved already: that their letters were the same in the original structure, can scarce be controverted. These letters, we think, were antediluvian; whether, to use the expression of Plato, they were dictated by some god, or fabricated by some man divinely inspired. As this opinion may admit some dispute, we shall take the liberty to subjoin our reasons.

§ *Nat. Hist.* lib. vii. c. 46.

‖ Lib. ii. c. 104.

* Ibid. c. 159.

25 Antediluvian.

1. It appears that the era of this invention is buried in impenetrable obscurity. Had an invention of such capital importance to mankind been made in the postdiluvian ages, we imagine the author would have been commemorated in the historical annals of the country where he lived (L).

2. The art of writing in alphabetical characters, according to the sacred records, was practised at so early a period, that there was not a long enough interval between that and the deluge to give birth to that noble invention. If we consider the state of the world during some ages after that disastrous event, we shall quickly be convinced that little respite could be found from the labour and industry indispensably requisite to provide the necessaries, and only a few of the conveniences, of life. Such a state of things was certainly most unfavourable to the invention of those arts and improvements which contribute nothing towards procuring the accommodations of life. The consequence is obvious.

Moses has recorded the history of the creation, of a few of the capital transactions of the antediluvian world, the birth, the age, the death, of the lineal descendants of Seth. He has preserved the dimensions of the ark, the duration of the universal deluge, its effects upon man and all terrestrial animals, the population of the world by the posterity of Noah, the age, &c. of the patriarchs of the line of Shem, from which his own ancestors had sprung. To this he has subjoined the petty occurrences which diversified the lives of Abraham, Isaac, and Jacob, and their descendants. Whence did the historian derive his information? We believe few of our readers will be so enthusiastic as to imagine that the author received it from divine inspiration. Tradition is a fallible guide; and in many cases the accounts are so minutely precise, as to defy the power of that species of conveyance. The inspired author must certainly have extracted his abridgement from written memoirs, or histories of the transactions of his ancestors regularly transmitted from the most early periods. These annals he probably abridged, as Ezra did afterwards the history of the kings of Israel. If this was the case, as it most certainly was, the art of writing in alphabetical letters must have been known and practised many ages before Moses. It has indeed been pretended, that the Jewish decalogue, inscribed upon two tables of stone, was the very first specimen of alphabetical writing. The arguments adduced in proof of this fact are lame and inconclusive

(K) See *Phædrus*, page 1240. See also page 374. *Phil.*

(L) It is true, the Egyptians attribute the invention to their Thoth, and the Phœnicians to their Hercules, or Melicerta or Baal; but these were only imaginary personages.

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clusive (M). Had that been the case, some notice must have been taken of so palpable a circumstance. Moses wrote out his history, his laws, and his memoirs; and it appears plainly from the text, that all the learned among his countrymen could read them. Writing was then no novel invention in the age of the Jewish legislator, but current and generally known at that era.

The patriarch Job lived at an earlier period. In that book we find many allusions to the art of writing, and

(M) The most ingenious and plausible of those arguments which have fallen under our observation, is given by Mr Johnson vicar of Cranbrook, a writer of great learning and piety, who flourished in the beginning of the 18th century, and whose works deserve to be more generally known than we have reason to think they are at present. After endeavouring to prove that alphabetical writing was not practised before the era of Moses, and expatiating upon the difficulty of the invention, this excellent scholar attempts to show, that the original Hebrew alphabet was actually communicated to the Jewish legislator at the same time with the two tables of the law. "I know not (says he) any just cause why the law should be *written by God*, or by an *angel* at his command, except it were for want of a man that could well perform this part. This could give no addition of authority to the law, especially after it had been published in that astonishing and miraculous manner at Mount Sinai. The true writing of the original was indeed perfectly adjusted, and precisely ascertained to all future ages, by God's giving a copy of it under his own hand; but this, I conceive, had been done altogether as effectually by God's dictating every word to Moses, had he been capable of performing the office of an amanuensis." The learned writer goes on to suppose, that it was for the purpose of *teaching Moses the alphabet*, that God detained him forty days in the mount; and thence he concludes, that the Decalogue was the first writing in alphabetical characters, and that those characters were a divine, and not a human invention.

It is always rash, if not something worse, to conceive reasons not assigned by God himself, for any particular transaction of his with those men whom he from time to time inspired with heavenly wisdom. That it was *not* for the purpose of teaching Moses the alphabet that God detained him forty days in the mount, when he gave him the two tables of the law, seems evident from his detaining him just as many days when he gave him the second tables after the first were broken. If the legislator of the Jews had not been sufficiently instructed in the art of reading during his first stay in the mount, he would have been detained longer; and it is not conceivable, that though in a fit of pious passion he was so far thrown off his guard as to break the two tables, his mind was so totally unhinged by the idolatry of his countrymen, as to forget completely an art which, by the supposition, the Supreme Being had spent *forty days* in teaching him! "But if Moses could, at his first ascent into the mount, perform the office of an amanuensis, why are the original tables said to have been written by the finger of God, and not by him who wrote the second?" We pretend not to say why they were written by God rather than man; but we think there is sufficient evidence, that by whomsoever they were written, the characters employed were of human invention. The Hebrew alphabet, without the Masoretic points, is confessedly defective; and every man who is in any degree acquainted with the language, and is not under the influence of inveterate prejudice, will readily admit that those points are no improvement. But we cannot, without impiety, suppose an art invented by infinite wisdom, to fall short of the utmost perfection of which it is capable: an alphabet communicated to man by God, would undoubtedly have been free both from defects and from redundancies; it would have had a distinct character for every simple sound, and been at least as perfect as the Greek or the Roman.

But we need not fill our pages with reasonings of this kind against the hypothesis maintained by Mr Johnson. We know that "Moses wrote all the words of the Lord," i. e. the substance of all that had been delivered in *Exod.* xx, xxi, xxii, xxiii. before he was called up into the mount to receive the tables of stone; nay, that he had long before been commanded by God himself to "write in a book" an account of the victory obtained over Amalek (*Exod.* xvii. 14.). All this, indeed, the learned writer was aware of; and to reconcile it with his hypothesis, he frames another, more improbable than even that which it is meant to support. "It is not unreasonable (says he) to believe that God had written these tables of stone, and put them in Mount Horeb, from the time that by his angel he had there first appeared to Moses; and that, therefore, all the time after, while he kept Jethro's sheep thereabouts, he had free access to those tables, and perused them at discretion. But if belief should rest upon evidence, we beg leave to reply, that to believe all this would be in the highest degree unreasonable; for there is not a single hint in the Scripture of the tables having been written at so early a period, or upon such an occasion, as God's first appearance to Moses in the burning bush. We know how reluctant Moses was to go upon the embassy to which he was then appointed; and it is strange, we think passing strange, that when he records so faithfully his own backwardness, and the means made use of by God to reconcile him to the arduous undertaking, he should make no mention of these important tables, if at that period he had known any thing of their existence. Besides all this, is it not wonderful, if Moses had been practising the art of writing, as our author supposes, from the time of the burning bush to the giving of the law, he should then have stood in need of *forty days* teaching from God, to enable him to *read* with ease the first tables; and of other forty, to enable him to *write* the second? This gives such a mean view of the natural capacity of the Hebrew legislator, as renders the hypothesis which implies it wholly incredible. See a *Collection of Discourses*, &c. *in two volumes, by the reverend John Johnson*, A. M. *vicar of Cranbrook in Kent.*

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and ſome paſſages which plainly prove its exiſtence. This ſhows that alphabetical characters were not confined to the choſen ſeed, ſince Job was in all probability a deſcendant of Huz, the eldeſt ſon of Nahor * the brother of Abraham. From this circumſtance, we think we may fairly conclude, that this art was known and practiſed in the family of Terah the father of Abraham.

* Gen. xxii. 20, &c.

3. There was certainly a tradition among the Jews in the age of Joſephus, that writing was an antediluvian invention †. That hiſtorian pretends, that the deſcendants of Seth erected two pillars, the one of ſtone and the other of brick, and inſcribed upon them their aſtronomical obſervations and other improvements.—This legend ſhows that there did exiſt ſuch an opinion of the antiquity of the art of writing.

† *Antiq.* lib. i. c. 3.

26 Traditions to this purpoſe.

4. There muſt have been a tradition to the ſame purpoſe among the Chaldeans, ſince the writers who have copied from Beroſus, the celebrated Chaldean hiſtorian (O), ſpeak of alphabetical writing as an art well known among the antediluvians. According to them, Oannes the Chaldean legiſlator gave his diſciples "an inſight into *letters* and ſcience. This perſon alſo *wrote* concerning the generation of mankind, of their different purſuits, of civil polity, &c. Immediately before the deluge (ſay they) the god Cronus appeared to Siſuthrus or Xiſuthrus, and commanded him to commit to *writing* the beginning, improvement, and concluſion of all things down to the preſent term, and to bury theſe accounts ſecurely in the temple of the Sun at Seppara." All theſe traditions may be deemed fabulous in the main; but ſtill they evince that ſuch an opinion was current, and that though the uſe of letters was not indeed eternal (P), it was, however, prior to all the records of hiſtory; and of courſe, we think, an antediluvian diſcovery.

27 The original alphabet preſerved in the family of Noah.

This original alphabet, whatever it was, and however conſtructed, was, we think, preſerved in the family of Noah, and from it conveyed down to ſucceeding generations. If we can then diſcover the original Hebrew alphabet, we ſhall be able to inveſtigate the primary ſpecies of letters expreſſive of thoſe articulate ſounds by which man is in a great meaſure diſtinguiſhed from the brute creation. Whatever might be the nature of that alphabet, we may be convinced that the ancient Jews deemed it ſacred, and therefore preſerved it pure and unmixed till the Babyloniſh captivity. If, then, any monuments are ſtill extant inſcribed with letters prior to that event, we may reſt aſſured that theſe are the remains of the original alphabet.

There have, from time to time, been dug up at Jeruſalem, and other parts of Judea, coins and medals, and medallions, inſcribed with letters of a form very different from thoſe ſquare letters in which the Hebrew Scriptures are now written.

28 The ſame with the Samaritan.

When the Samaritan Pentateuch was diſcovered (Q), it evidently appeared that the inſcriptions on thoſe medals and coins were drawn in genuine Samaritan characters. The learned abbé Barthelemi, in his * diſſertation "on the two medals of Antigonus king of Judea, one of the later Aſmonean princes, proves that all the inſcriptions on the coins and medals of Jonathan and Simon Maccabeus, and alſo on his, were invariably in the Samaritan character, down to the 40th year before the Chriſtian era."

* *Mem. de l'Academ. de l'Inſcrips.* &c.

It were eaſy to prove, from the Miſhna and Jeruſalem Talmud, that the Scriptures publicly read in the ſynagogues to the end of the ſecond century were written in the Samaritan character, we mean in the ſame character with the Pentateuch in queſtion. As the ancient Hebrew, however, ceaſed to be the vulgar language of the Jews after their return from the Babyloniſh captivity, the copies of the Bible, eſpecially in private hands, were accompanied with a Chaldaic paraphraſe; and at length the original Hebrew character fell into diſuſe, and the Chaldaic was univerſally adopted.

29 Which afterwards gave place to the Chaldaic.

It now appears that the letters inſcribed on the ancient coins and medals of the Jews were written in the Samaritan form, and that the Scriptures were written in the very ſame characters: we ſhall therefore leave it to our readers to judge whether (conſidering the implacable hatred which ſubſiſted between theſe two nations) it be likely that the one copied from the other; or at leaſt that the Jews preferred to the beautiful letters uſed by their anceſtors, the rude and inelegant characters of their moſt deteſted rivals. If, then, the inſcriptions on the coins and medals were actually in the characters of the Samaritan Pentateuch (and it is abſurd to ſuppoſe that the Jews borrowed them from the Samaritans), the conſequence plainly is, that the letters of the inſcriptions were thoſe of the original Hebrew alphabet, coeval with that language, which we dare to maintain was the firſt upon earth.

It may, perhaps, be thought rather ſuperfluous to mention, that the Samaritan coloniſts, whom the kings of Aſſyria planted in the cities of Samaria (R), were natives of countries where Chaldaic letters were current, and who were probably ignorant of the Hebrew language and characters. When thoſe coloniſts embraced the Jewiſh religion, they procured a copy of the Hebrew Pentateuch written in its native character, which, from ſuperſtition, they preſerved inviolate as they received

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(O) Apollodorus, Alexander Polyhiſtor, Abydenus. See *Syncellus*, cap. 39. *et ſeq. Euſeb. Chron.* lib. i. page 3.

(P) Plin. Nat. Hiſt. lib. vii. page 413.——*Ex quo apparet æternus literarum uſus.*

(Q) The celebrated Archbiſhop Uſher was the firſt who brought the Samaritan Pentateuch into Europe. In a letter to Ludovicus Capellus "he acknowledges, that the frequent mention he had ſeen made of it by ſome authors, would not ſuffer him to be at reſt till he had procured five or ſix copies of it from Paleſtine and Syria."

(R) 2 Kings, chap. xvii. ver. 24. "And the king of Aſſyria brought men from Babylon, and from Cuthah, and from Avah, and from Hamath, and from Sepharvaim, and placed them in the cities of Samaria." Babylon and Cuthah, and Avah, were neighbouring cities, and undoubtedly both ſpoke and wrote in the Chaldaic ſtyle. The natives of Hamath ſpoke the Syriac, which at that time differed very little from the Chaldaic.

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ceived it; and from it were copied ſucceſſively the others which were current in Syria and Paleſtine when Archbiſhop Uſher procured his.

From the reaſons above exhibited, we hope it will appear, that if the Hebrew alphabet, as it appears in the Samaritan Pentateuch, was not the primitive one, it was at leaſt that in which the Holy Scriptures were firſt committed to writing.

* *Chron. in anno* 4740.
† *Praef.* 1. *Reg.*

30
Which was introduced by Ezra.

Scaliger has inferred, from a paſſage in Euſebius *, and another in St Jerome †, that Ezra, when he reformed the Jewiſh church, tranſcribed the Scriptures from the ancient characters of the Hebrews into the ſquare letters of the Chaldeans. This, he thinks, was done for the uſe of thoſe Jews who, being born during the captivity, knew no other alphabet than that of the people among whom they were educated.—This account of the matter, though probable in itſelf, and ſupported by paſſages from both Talmuds, has been attacked by Buxtorf with great learning and no leſs acrimony. Scaliger, however, has been followed by a crowd of learned men (S), whoſe opinion is now pretty generally eſpouſed by the ſacred critics.

Having ſaid ſo much concerning the Hebrew alphabet in the preceding pages, we find ourſelves laid under a kind of neceſſity of hazarding a few ſtrictures on the vowels and Maſoretic points; the *firſt* eſſential, and the *laſt* an appendage, of that ancient language. The number of the one, and the nature, antiquity, and neceſſity of the other, in order to read the language with propriety and with diſcrimination, have been the ſubject of much and often illiberal controverſy among philological writers. To enter into a minute detail of the arguments on either ſide, would require a complete volume: we ſhall, therefore, briefly exhibit the ſtate of the controverſy, and then adduce a few obſervations, which, in our opinion, ought to determine the queſtion.

31
The Hebrew vowels.

The controverſy then is, Whether the Hebrews uſed any vowels; or whether the points, which are now called by that name, were ſubſtituted inſtead of them? or if they were, whether they be as old as Moſes, or were invented by Ezra, or by the Maſſorites (T)? This controverſy has exerciſed the wits of the moſt learned critics of the two laſt centuries, and is ſtill far enough from being determined in the preſent. The Jews maintain, that theſe vowel points (U) were delivered to Moſes along with the tables of the law; and conſequently hold them as ſacred as they do the letters themſelves. Many Chriſtian authors who have handled this ſubject, though they do not affirm their divine original, nor their extravagant antiquity, pretend, however, that they are the only proper vowels in the language, and regulate and aſcertain its true pronunciation. Though they differ from the Jews with reſpect to the origin of theſe points, they yet allow them a pretty high antiquity, aſcribing them to Ezra and the members of the great ſynagogue.

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32
The Maſoretic points a modern invention.

At length, however, about the middle of the 16th century, Elias Levita, a learned German Jew who then flouriſhed at Rome, diſcovered the deluſion, and made it appear that theſe appendages had never been in uſe till after the writing of the talmuds, about 500 years after Chriſt. This innovation raiſed Elias a multitude of adverſaries, both of his own countrymen and Chriſtians. Among the latter appeared the two Buxtorfs, the father and the ſon, who produced ſome cabbaliſtical books of great antiquity (X), at leaſt in the opinion of the Jews, in which there was expreſs mention of the points. The Buxtorfs were anſwered by Capellus and other critics *, till Father Morinus †, having examined all that had been urged on both ſides, produced his learned diſſertation on that ſubject; againſt which there has been nothing replied of any conſequence, whilſt his work has been univerſally admired, and his opinion confirmed by thoſe that have beaten the ſame field after him.

* Walton, Dupin, and Voſſius.
† *Diſſert. Bibl.*

According to this learned father, it plainly appears that neither Origen, nor St Jerome, nor even the compilers of the talmuds, knew any thing of what has been called the vowel points; and yet theſe books, according to the ſame author, were not finiſhed till the ſeventh century. Even the Jewiſh rabbis who wrote during the eighth and ninth centuries, according to him, were not in the leaſt acquainted with theſe points. He adds, that the firſt veſtiges he could trace of them were in the writings of Rabbi Ben Aber chief of the weſtern, and of Rabbi Ben Naphtali chief of the eaſtern, ſchool, that is, about the middle of the tenth century; ſo that they can hardly be ſaid to be older than the beginning of that period.

Some learned men (Y) have aſcribed the invention of the vowel points in queſtion to the rabbis of the ſchool of Tiberias; which, according to them, flouriſhed about the middle of the ſecond century. This opinion is by no means probable, becauſe it appears plain from hiſtory, that before that period all the Jewiſh ſeminaries in that province were deſtroyed, and their heads forced into exile. Some of theſe retired into Babylonia, and ſettled at Sora, Naherds, and Pombeditha, where they eſtabliſhed famous univerſities. After this era, there remained no more any rabbinical ſchools in Judæa, headed by profeſſors capable of undertaking this difficult operation, nor indeed of ſufficient authority to recommend it to general practice, had they been ever ſo thoroughly qualified for executing it.

Capellus and Father Morin, who contend for the late introduction of the vowel-points, acknowledge that

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(S) Caſaubon, Grotius, Voſſius, Bochart, Morin, Brerewood, Walton, Prideaux, Huet, and Lewis Capel, always a ſworn enemy to Buxtorf. All theſe have maintained the ſame ground with Scaliger: how truly, appears above.

(T) The term *maſorah* or *maſſoreth* ſignifies "tradition;" and imports the unwritten canon by which the reading and writing of the ſacred books was fixed.

(U) Theſe points are 14 in number, whoſe figures, names, and effects, may be ſeen in moſt Hebrew grammars.

(X) Theſe books are the *Bahir*, *Zahar*, and the *Kizri*. As for the Kizri, the Jews make it about 1900 years old; and the other about a century later. But the fidelity of the Jews in ſuch matters cannot be relied upon.

(Y) See Buxtorf the father, in Tiber. cap. 5, 6, 7. Buxtorf the ſon, de Antiq. Punct. P. II. 11.

that there can certainly be no language without vocal ſounds, which are indeed the ſoul and eſſence of ſpeech; but they affirm that the Hebrew alphabet actually contains vowel characters, as well as the Greek and Latin and the alphabets of modern Europe. Theſe are *aleph*, *he*, *vau*, *jod*. Theſe they call the *matres lectionis*, or, if you pleaſe, the parents of reading. To theſe ſome, we think very properly, add *ain* or *oin*, *ajin*. Theſe, they conclude, perform exactly the ſame office in Hebrew that their deſcendants do in Greek. It is indeed agreed upon all hands, that the Greek alphabet is derived from the Phœnician, which is known to be the ſame with the Samaritan or Hebrew. This poſition we ſhall prove more fully when we come to trace the origin of the Greek tongue. Hitherto the analogy is not only plauſible but the reſemblance preciſe. The Hebrews and Samaritans employed theſe vowels exactly in the ſame manner with the Greeks; and ſo all was eaſy and natural.

33 The *matres lectionis*.

34 Objections anſwered.

But the aſſertors of the Maſoretic ſyſtem maintain that the letters mentioned above are not vowels but conſonants or aſpirations, or any thing you pleaſe but vocal letters. This they endeavour to prove from their uſe among the Arabians, Perſians, and other oriental nations: But to us it appears abundantly ſtrange to ſuppoſe that the Greeks pronounced *beta*, *gamma*, *delta*, &c. exactly as the Hebrews and the Phœnicians did, and yet at the ſame time did not adopt their mode of pronunciation with reſpect to the five letters under conſideration. To this argument we think every objection muſt undoubtedly yield. The Greeks borrowed their letters from the Phœnicians; theſe letters were the Hebrew or Samaritan. The Greeks wrote and (z) pronounced all the other letters of their alphabet, except the five in queſtion, in the ſame manner with their originals of the eaſt: if they did ſo, it obviouſly follows that the Greek and oriental office of theſe letters was the ſame.

Another objection to reading the Hebrew without the aid of the Maſoretic vowel points, ariſes from the conſideration, that without theſe there will be a great number of radical Hebrew words, both nouns and verbs, without any vowel intervening amongſt the conſonants, which is certainly abſurd. Notwithſtanding this ſuppoſed abſurdity, it is a well known fact, that all the copies of the Hebrew Scripture, uſed in the Jewiſh ſynagogues throughout the world, are written or printed without points. Theſe copies are deemed ſacred, and kept in a coffer with the greateſt care, in alluſion to the ark of the teſtimony in the tabernacle and temple. The prefect, however, reads the portions of the law and hagiographa without any difficulty. The ſame is done by the remains of the Samaritans at this day. Every oriental ſcholar knows that the people of theſe countries look upon conſonants as the ſtamina of words. Accordingly, in writing letters, in diſpatches upon buſineſs, and all affairs of ſmall moment, the vowels are generally omitted. It is obvious, that in every original language the ſound of the vowels is variable and of little importance. Such was the caſe with the Hebrew tongue: Nor do we think that the natives of the country would find it a matter of much difficulty to learn to read without the help of the vowels. They knew the words beforehand, and ſo might readily enough learn by practice what vowels were to be inſerted.

When the Hebrew became a dead language, as it certainly was in a great meaſure to the vulgar after the return from the Babyloniſh captivity; ſuch ſubſidiaries might we think, have been uſeful, and of courſe might poſſibly have been adopted for the uſe of the vulgar: but the ſcribe, the lawyer, and the learned rabbi, probably diſdained ſuch beggarly elements. We ſhall in this place hazard a conjecture, which, to us at leaſt, is altogether new. We imagine that the Phœnicians, who were an inventive, ingenious people, had, prior to the age of Cadmus, who firſt brought their letters into Greece, adopted the more commodious method of inſerting the vowels in their proper places; whereas the Jews, zealouſly attached to the cuſtoms of their anceſtors, continued to write and read without them. In this manner the Gephuræi *, who were the followers of Cadmus, communicated them to the Jones their neighbours. We are convinced that the materials of the Greek tongue are to be gleaned up in the eaſt; and upon that ground have often endeavoured to trace the origin of Greek words in the Hebrew, Phœnician, Chaldean, and Arabian languages. Reading without the vowel points we have ſeldom failed in our ſearch; but when we followed the method of reading by the Maſoretic points, we ſeldom ſucceeded; and this, we believe, every man of tolerable erudition who will make a trial will find by experience to be true. This argument appears to us ſuperior to every objection. Upon this baſis, the moſt learned Bochart has erected his etymological fabric, which will be admired by the learned and ingenious as long as philology ſhall be cultivated by men.

* *Herod.* lib. i. cap. 56.

35 Proof that the Maſoretic points are modern.

It has been urged by the zealots for the Maſoretic ſyſtem, that the Arabians and Perſians employ the vowel points. That they do ſo at preſent is readily granted; but whether they did ſo from the beginning ſeems to be the queſtion. That Arabia was overſpread with Jewiſh exiles at a very early period, is abundantly certain. It was natural for them to retire to a land where they would not hear of war nor the ſound of the trumpet. Accordingly we find that, prior to the age of the Arabian impoſtor, Arabia ſwarmed with Jewiſh ſettlements. From theſe Jews, it is highly probable that their neighbours learned the uſe of the points in queſtion; which in the courſe of their conqueſts the Saracens communicated to the Perſians.

It has been alleged with great ſhow of reaſon, that without the vowel points, it is often impoſſible to develope the genuine ſignification of many words which occur frequently in the language: many words of different and ſometimes oppoſite ſignifications are written with exactly the ſame conſonants. Without the points, then, how are we to know the diſtinction? In anſwer to this objection, we beg leave to obſerve, that, during the firſt period of a language, it is impoſſible that there ſhould

(z) This is ſo true, that, according to Heſychius and Suidas, φοινικιζειν, to act the Phœnician, ſignified "to read."

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ſhould not occur a number of ſimilar ſounds of different ſignifications. This is ſurely to be attributed to the poverty of the language. When a few terms have been once fabricated, men will rather annex new ſignifications to old terms, than be at the expence of time or thought to invent new ones. This muſt have been the caſe with the Hebrew in particular; and indeed no language on earth is without inſtances of this inconveniency, which, however, in a living tongue, is eaſily overcome by a difference of accent, tone, geſture, pronunciation; all which, we think, might obviate the difficulty.

From the preceding arguments, we think ourſelves authoriſed to infer that the Maſora is a novel ſyſtem, utterly unknown to the moſt ancient Jews, and never admitted into thoſe copies of the Scriptures which were deemed moſt ſacred and moſt authentic by that people.

With reſpect to the original introduction of the points, we agree with the learned and judicious * Dr Prideaux, who imagines that they were gradually introduced after the Hebrew became a dead language, with a view to facilitate the learning to read that language, more eſpecially among the vulgar. By whom they were introduced, we think, cannot eaſily be determined; nor is it probable that they were all introduced at once, or by one and the ſame perſon. They have been aſcribed to Ezra by many, for no other reaſon that we can diſcover but to enhance their authenticity, and becauſe the ſentiment is analogous to the other articles of reformation eſtabliſhed by that holy prieſt. If our curious reader ſhould not be ſatisfied with the preceding detail, we muſt remit him to Capellus and Morinus on the one ſide, and the two Buxtorfs, Schultens, and Dr James Robertſon late profeſſor of oriental languages in the univerſity of Edinburgh, on the other. This learned orientaliſt, in his diſſertation prefixed to his *Clavis Pentateuchi*, has collected and arranged, with the true ſpirit of criticiſm, every thing that has been advanced in favour of the Maſoretical ſyſtem.—*Si Pergama dextra defendi poſſent, etiam hac defenſa fuiſſent.*

* Connect. part i. book i.

36 From Origen's Hexapla,

St Origen, who flouriſhed about the beginning of the 3d century, was a profound Hebrew ſcholar. He publiſhed a moſt laborious and learned work, which is generally called the *Hexapla*, becauſe it conſiſted of ſix columns; the firſt of which contained the Hebrew text; the ſecond, the ſame text, but written in Greek characters: the third column exhibited the verſion of Aquila; the fourth that of Symmachus; the fifth, the Septuagint; and the ſixth the verſion of Theodotan. In ſome fragments of that vaſt work which are ſtill extant, we have a ſpecimen of the manner in which the Hebrew was pronounced in the third century, by which it appears that it was very different from that which reſults from obſerving the Maſoretical points. The following is an inſtance copied from the beginning of Geneſis.

According to ORIGEN.

Brêſith bara Elô-im eth aſamaim oueth aares.

Ouaares aietha Thôau ouboou ouôſekh al phne Theôm ouroué elôeim maraepheth al phne amaim.

Ouiômer elôeim iei ôr ouiei ôr.

Ouiar elô-im eth aôr khi tôb ouiabdêl elôeim bên aôr oubên aôſekh.

According to the MASORITES.

Bereſhith bara Elohim eth aſhamajim veeth aaretz.

Veaaretz ajetha thoou vaboou, vekhoſhek gnal pené theom verouakh elohim merakhepheth gnal pené hammáim.

Vaiomer elohim jehi or, vajehi or.

Vajare elohim eth aor ki tob vajabedel elohim bein aor oubein hakhoſhek.

Upon the whole, we preſume to give it as our opinion, that in the moſt early periods, the vowels, *aleph*, *he*, *jod* or *yod*, *vow* or *waw*, and perhaps *ain* or *ajin*, were regularly written wherever they were ſounded. This to us appears plain from the practice of the ancient Greeks. It is agreed on all hands that the Samaritan and Phœnician alphabets were the ſame; and that the former was that of the Jews originally. The Phœnicians certainly wrote the vowels exactly, for ſo did the Greeks who copied their alphabet: If the Phœnicians wrote their vowels, ſo then did the Jews of the age of Cadmus; but Cadmus was contemporary with ſome of the earlieſt judges of Iſrael; the conſequence is evident, namely, that the Jews wrote their vowels as late as the arrival of that colony-chief in Greece. We ought naturally to judge of the Hebrew by the Chaldaic, Syriac, and Arabian, its ſiſter dialects. All theſe languages in ancient times had their vowels regularly inſerted; and why not the Hebrew in the ſame manner with the reſt?

37 and the practice of the ancient Greeks.

As theſe firſt vowels which were coeval with the other letters, often varied in their ſound and application, the points, in all appearance, were firſt invented and employed to aſcertain their different ſounds in different connections. Other marks might be invented to point out the various tones of voice, like the τονοι, or accents, with which the vowels were to be enounced, as was done among the later Greeks. In proceſs of time, in order to promote celerity of writing, the vowels were omitted, and the points ſubſtituted in their place.

Before we conclude our obſervations on the Hebrew language, we ought, perhaps, to make an apology for omitting to interlard our details with quotations from the two Talmuds, the Miſhna, the Gemara, the Cabbalas, and a multitude of rabbinical writers who are commonly cited upon ſuch an occaſion. We believe we could have quoted almoſt numberleſs paſſages from the two Buxtorfs, Father Morin, Capellus, and other Hebrew critics, with no great trouble to ourſelves, and little emolument to the far greater part of our readers. But our opinion is that ſuch a pedantic diſplay of philological erudition would probably have excited the mirth of our learned, and rouſed the indignation of our unlearned, readers. Our wiſh is, to gratify readers of both deſcriptions, by contributing to the edification of one claſs without diſguſting the other.

We cannot, we imagine, fairly take leave of the ſacred language, without giving a brief detail of thoſe excellencies which, in our opinion, give it a juſt claim to the ſuperiority over thoſe other tongues which have ſometimes contended with it for the prize of antiquity?

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quity: and of these the following in our apprehension deserve particular notice.

3
Excellencies of the Hebrew Language.

If this language may claim any advantage over its antagonists, with respect to its being rather a mother than a daughter to any of them, it is undoubtedly in consequence of its simplicity, its purity, its energy, its fecundity of expressions and significations.* In all these, notwithstanding its paucity of words, it excels the vast variety of other languages which are its cognate dialects. To these we may add the significancy of the names, both of men and brutes; the nature and properties of the latter of which are more clearly and more fully exhibited by their names in this than in any other tongue hitherto known. Besides, its well authenticated antiquity and the venerable tone of its writings surpass any thing left upon record in any other dialect now extant in the world. These extraordinary qualities excite our admiration at present under every disadvantage; and from this circumstance we may infer its incomparable beauty in the age of the Jewish legislator, and what effects it would naturally produce, could we know it now as it was spoken and written in the days of David and Solomon.

As far, however, as we understand it in its present mutilated condition, and are able to judge of its character from those few books that have come down to our time, we plainly perceive that its genius is simple, primitive, natural, and exactly conformable to the character of those uncultivated patriarchs who used it themselves, and transmitted it to their descendants in its native purity and simplicity. Its words are comparatively few, yet concise and expressive; derived from a very small number of radicals, without the artificial composition of modern languages. No tongue, ancient or modern, can rival it in the happy and rich fecundity of its verbs, resulting from the variety and significancy of its conjugations; which are so admirably arranged and diversified, that by changing a letter or two of the primitive, they express the various modes of acting, suffering, motion, rest, &c. in such a precise and significant manner, that frequently in one word they convey an idea which, in any other language, would require a tedious paraphrase. These positions might easily be illustrated by numerous examples; but to the Hebrew scholar these would be superfluous, and to the illiterate class neither interesting nor entertaining.

To these we may add the monosyllabic tone of the language, which, by a few prefixes and affixes without affecting the radix, varies the signification almost at pleasure, while the method of affixing the person to the verb exhibits the gender of the object introduced. In the nouns of this language there is no flexion except what is necessary to point out the difference of gender and number. Its cases are distinguished by articles, which are only single letters at the beginning of the word: the pronouns are only single letters affixed; and the prepositions are of the same character prefixed to words. Its words follow one another in an easy and natural arrangement, without intricacy or transposition, without suspending the attention or involving the sense by intricate and artificial periods. All these striking and peculiar excellencies combined, plainly demonstrate the beauty, the stability, and antiquity of the language under consideration.

We would not, however, be thought to insinuate that this tongue continued altogether without changes and imperfections. We admit that many radical words of it were lost in a course of ages, and that foreign ones were substituted in their place. The long sojourning of the Israelites in Egypt, and their close connection with that people, even *quoad sacra*, must have introduced a multitude of Egyptian vocables and phrases into the vulgar dialect at least, which must have gradually incorporated with the written language, and in process of time have become parts of its essence. In Egypt, the Israelites imbibed those principles of idolatry which nothing less than the final extirpation of their polity could eradicate. If that people were so obstinately attached to the Egyptian idolatry, it is not very probable that they would be averse from the Egyptian language. Besides, the Scripture informs us, that there came up out of Egypt *a mixed multitude;* a circumstance which must have infected the Hebrew tongue with the dialect of Egypt. As none of the genuine Hebrew radicals exceed three letters, whatever words exceed that number in their radical state may be justly deemed of foreign extraction.

Some Hebrew critics have thought that verbs constitute the radicals of the whole language; but this opinion appears to us ill founded: for though many Hebrew nouns are undoubtedly derived from verbs, we find at the same time numbers of the latter deduced from the former.

Before we conclude our detail of the Hebrew tongue, a few of our readers may possibly imagine that we ought to give some account of the Hutchinsonian system; a system so highly in vogue not many years ago. But as this allegorical scheme of interpretation is now in a manner exploded, we shall beg leave to remit our curious Hebraist to Mr Holloway's Originals, a small book in 2 vols 8vo, but replete with multifarious erudition, especially in the Hutchinsonian style and character.—*Fides sit penes autorem.*

39 Hutchinsonianism.

Sect. II. *The Arabic Language.*

We now proceed to give some account of the Arabian language, which is evidently one of the sister dialects of the Hebrew. Both, we imagine, were originally the same; the former highly improved and enlarged; the latter, in appearance, retaining its original simplicity and rude aspect, spoken by a people of a genius by no means inventive. In this inquiry, too, as in the former, we shall spare ourselves the trouble of descending to the grammatical minutiæ of the tongue; a method which, we are persuaded, would neither gratify our learned nor edify our unlearned readers. To those who are inclined to acquire the first elements of that various, copious, and highly improved tongue, we beg to recommend *Erpenii Rudimenta Ling. Arab.; Golii Gram. Arab.;* the Dissertations of Hariri, translated by the elder Schultens; Mr Richardson's Persic and Arabic Gram. &c.

40 Arabic language originally Hebrew.

We have pronounced the Hebrew and Arabian sister dialects; a relation which, as far as we know, has been seldom controverted: but we think there is authentic historical evidence that they were positively one and the same, at a period when the one as well as the other

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other appeared in its infant unadorned simplicity. The following detail will, we hope, fully authenticate the truth of our position.

* Gen. x. 25.

"Unto Eber (says the Scripture *) were born two sons. The name of one was Peleg, because in his days the earth was divided; and his brother's name was Joktan," or rather Yoktan. This last, says the sacred historian, "had thirteen sons; and their dwelling reached from Mesha (Mocha) to Sephar (A)," a mount of the east. According to this account, the descendants of Yoktan possessed all the maritime coasts of Arabia from Mesha (Mocha) to Mount Sephar towards the east of that peninsula. Moses, describing the rivers of paradise, tells us, that one of the branches of that river † "encompassed the whole land of Havilah, where there was great store of gold." Havilah was the twelfth son of Yoktan, whom the Arabians call Kobtan; and consequently his territory was situated towards the eastern limit of the possessions of the posterity of the youngest son of Eber. Yoktan or Kobtan was too young to be concerned in the building of the tower; and consequently retained the language of his family, which was undoubtedly the Hebrew. His descendants must have carried the same language into their respective settlements, where it must have been transmitted to succeeding generations. The original language of all the tribes of the Arabians who inhabit a vast tract of country along the southern shore, according to this deduction, was that of their father Kobtan, that is, the Hebrew. Indeed, the most learned Arabians of modern times unanimously acknowledge this patriarch as the founder of their language as well as of their nation.

† Gen. ii. 11.

The other districts of Arabia were peopled by the offspring of Abraham. The Ishmaelites, the posterity of that patriarch by Hagar, penetrated into the very centre of the peninsula; incorporated, and in process of time became one people with the Kobtanites. Another region was possessed by the children of the same holy man by Cheturah his second wife. The Moabites, Ammonites, Edomites, Amalekites, &c. who settled in the various regions of Arabia Petræa, were all branches of Abraham's family, and used the same language with their great progenitor. The Scripture indeed speaks of people who inhabited the country last mentioned prior to the branches of Abraham's family; but these, according to the same history, were extirpated by the former. The conclusion then is, if we credit the Mosaic account, that all the inhabitants of the three divisions of Arabia did, in the earliest periods, universally use the Hebrew tongue.

There was, we are sensible, a region of Arabia inhabited by the Cushim, or descendants of Cush. This district was situated on the confines of Babylonia. Our translators have confounded this country with the modern Ethiopia; and have consequently ascribed the exploits of the Arabian Cushim to the Ethiopians. The Arabian kings of Babylon were of those Cushim. These were conquered and expelled Babylonia by the Chasidim. These spoke the Chaldean dialect, as will appear when we come to speak of that of the Abyssinians. Here the candid reader is desired to reflect that the Hebrew and Chaldaic are cognate dialects.

The foregoing proofs, deduced from the Mosaic history, will be corroborated by a mass of internal evidence in the succeeding parts of our inquiry.

41 Gradually deviated from that simplicity.

The Arabic tongue, originally pure Hebrew, was in process of time greatly transformed and altered from its simple unsophisticated state. The Arabians were divided into many different tribes; a circumstance which naturally produced many different dialects. These, however, were not of foreign growth. No foreign enemy ever conquered those independent hordes. The Persians, Greeks, and Romans, sometimes attempted to invade their territories; but the roughness of the ground, the scarcity of forage, the penury of water, and their natural bravery, always protected them. They were indeed once invaded by the Abyssinians or Ethiopians with some show of success; but these invaders were in a short time expelled the country. Their language, of consequence, was never adulterated with foreign words or exotic phrases and idioms. Whatever augmentations or improvements it received were derived from the genius and industry of the natives, and not from adventitious or imported acquisitions. From this circumstance we may justly infer, that the Arabian tongue was a long time stationary, and of course differed in no considerable degree from its Hebrew archetype. The learned Schultens, in his Commentary on Job, hath shown, to the conviction of every candid inquirer, that it is impossible to understand that sublime composition without having recourse to the Arabic idioms. That patriarch was a Chuzite. His country might be reckoned a part of Arabia. His three friends were actually Arabians, being the descendants of Ishmael and Esau. His country bordered with that of the predatory Chaldeans, who were an Arabian banditti. When we consider all these circumstances *in cumulo*, we are strongly inclined to believe that the book of Job was actually written in Arabic, as the language stood at that period; which, according to the most probable opinion, could not have been later than the age of Moses. The learned are generally agreed that this whole book, the three first chapters excepted, is a poetical composition, replete with the most brilliant and most magnificent imagery, the boldest, the justest, and most gorgeous tropes and allusions, and a grandeur of sentiment wholly divine. Whoever has read the poetical compositions of the modern Arabians, on divine subjects, with any degree of taste, will, we flatter ourselves, discover a striking similarity both of diction and sentiment. Be this as it may, we think there is no reason to conclude that the Arabic dialect deviated much from the Hebrew standard prior to the Christian era.

42 The two principal dialects of Arabia.

Of those different dialects which prevailed among the various tribes among which the peninsula of Arabia was divided, the principal were the Hemyaret and the Koreish. Though some of these were tributary to the Tobbas, or Hemyaret sovereign of Arabia Felix, yet they took no great pains to cultivate the language of that province, and of course these people did not thoroughly

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(A) Sephar, in the Septuagint Σωφηρα, and in some editions Σωφηρα: hence probably Σωφιρ. *Orig. in Job* chap. xxii. ver. 14. Φασιδε τινες των Ερμηνεων Σωφιρ την Αφρικην ειναι.

roughly underftand it. As for the independent tribes, they had no temptation to cultivate any other language than their own.

The Koreifh tribe was the nobleft and the moft learned of all the weftern Arabs; and the kaaba, or fquare temple of Mecca, was before the era of Mohammed folely under their protection. This temple drew annually a great concourfe of pilgrims from every Arabian tribe, and indeed from every other country where the Sabian religion prevailed. The language of the Koreifh was ftudied with emulation by the neighbouring tribes. Numbers of the pilgrims were people of the firft rank, and poffeffed all the fcience peculiar to their country or their age. Great fairs were held during their refidence at Mecca, and a variety of gay amufements filled up the intervals of their religious duties. In thefe entertainments literary compofitions bore the higheft and moft diftinguifhed rank; every man of genius confidering not his own reputation alone, but even that of his nation or his tribe, as interefted in his fuccefs. Poetry and rhetoric were chiefly efteemed and admired; the firft being looked upon as highly ornamental, and the other as a neceffary accomplifhment in the education of every leading man. An affembly at a place called *Ocadh*, had been in confequence eftablifhed about the end of the fixth century, where all were admitted to a rivalfhip of genius. The merits of their refpective productions were impartially determined by the affembly at large; and the moft approved of their poems, written on filk, in characters of gold, were with much folemnity fufpended in the temple, as the higheft mark of honour which could be conferred on literary merit. Thefe poems were called the *Moallakat*, "fufpended," or *Modhahebat*, "golden." Seven of thefe are ftill preferved in many European libraries.

43 The dialect of the Koreifh became the politeft, and why.

From this uncommon attention to promote emulation, and refine their language, the dialect of the Koreifh became the pureft, the richeft, and the moft polite, of all the Arabian idioms. It was ftudied with a kind of predilection; and about the beginning of the feventh century it was the general language of Arabia, the other dialects being either incorporated with it, or fliding gradually into difufe. By this fingular idiomatic union the Arabic has acquired a prodigious fecundity; whilft the luxuriance of fynonymes, and the equivocal or oppofite fenfes of the fame or fimilar words, hath furnifhed their writers with a wonderful power of indulging, in the fulleft range, their favourite paffion for antithefis and quaint allufion. One inftance of this we have in the word *veli*; which fignifies a *prince*, a *friend*, and alfo a *flave*. This fame word, with the change of one letter only, becomes *vali*; which, without equivocation, imports a *fovereign*. Examples of this kind occur in almoft every page of every Arabic dictionary.

44 This fuperiority modern.

But all thefe advantages of this incomparable language are merely modern, and do not reach higher than the beginning of the fixth century. Prior to that era, as we have obferved above, a variety of dialects obtained; and as the Arabs were by their fituation in a manner fequeftered from all the reft of mankind, it may not perhaps be fuperfluous to inquire briefly into the caufe and origin of this inftantaneous and univerfal change.

For a courfe of more than 20 centuries, the Arabians had been fhut up within the narrow limits of their own peninfula, and in a great meafure fecluded from the reft of the world. Their commerce with India was purely mercantile, and little calculated to excite or promote intellectual improvements. They traded with the Egyptians from time immemorial; but fince the invafion and ufurpation of the paftor kings, every fhepherd, that is, every Arabian, was an abomination to the Egyptians. From that quarter, therefore, they could not derive much intellectual improvement. Befides, when an extenfive territory is parcelled out among a number of petty fepts or clans, the feuds and contefts which originate from interfering interefts and territorial difputes, leave but little time, and lefs inclination, for the culture of the mind. In thefe circumftances, the military art alone will be cultivated, and the profeffion of arms alone will be deemed honourable. Of confequence, we find that, in the general opinion, poetry, rhetoric, and the profeffion of arms, were the only fciences cultivated by the people in queftion. As for the fcience of arms, we are convinced that it was both ftudied and practifed at a very early period; but as to the two former, we imagine they were very late acquifitions, and fprung from fome circumftance external and adventitious.

The tribe of the Koreifh were much engaged in commerce. They exported frankincenfe, myrrh, caffia, galbanum, and other drugs and fpices, to Damafcus, Tripoli, Palmyra, and other commercial cities of Syria and its neighbourhood. Upon thefe occafions the Arabian traders muft have become acquainted with the Greek language, and perhaps with the more amufing and affecting parts of the Grecian literature. They might hear of the high renown of Homer and Demofthenes; and it is not impoffible that fome of them might be able to read their compofitions. Every body knows with what unremitting ardour the learned Arabs, under the firft caliphs, perufed and tranflated the philofophical works of the Grecian fages. The very fame fpirit might animate their predeceffors, though they wanted learning, and perhaps public encouragement, to aroufe their exertions. From this quarter, we think, the Arabs may have learned to admire, and then to imitate, the Grecian worthies.

The Ptolemies of Egypt were the profeffed patrons of commerce as well as of learning. Under thefe princes all nations were invited to trade with that happy country. The Arabs, now no longer fettered by Egyptian jealoufy, carried their precious commodities to Alexandria; where the Grecian literature, though no longer in its meridian fplendour, fhone however with a clear unfaded luftre. The court of the firft Ptolemies was the retreat of all the moft celebrated geniufes of Greece and of the age; in a word, Alexandria was the native land of learning and ingenuity. Here the ingenious Arab muft have heard the praifes of learning inceffantly proclaimed; muft have been often prefent at the public exhibitions of the poets and orators; and even though he did not underftand them exactly, might be charmed with the melody of the diction, and ftruck with furprife at their effects on the audience. The reader will pleafe to reflect, that the Arabian traders were the firft men of the nation, both with refpect to birth, learning, and fortune. Thefe wife men, to ufe the language of Scripture, infpired with the natural curiofity of their race, might hear of the celebrated Olympic games, the public recitations before that affembly, and

45 Inftitution at Mecca fimilar to the Olympic games.

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the glorious prize beſtowed upon the conquerors. Such information might animate them to inſtitute ſomething parallel at Mecca, with a view to improve their language, and at the ſame time to derive honour and emolument to themſelves. The Koreiſhim might promiſe themſelves the like advantages from the eſtabliſhment of the fair and aſſembly at Ocadh, as the natives of Elis drew from the inſtitution of the Olympic games. For theſe reaſons, we conjecture, the literary competitions at the place juſt mentioned were inſtituted at ſo late a period, though the nation had exiſted more than 2000 years before the eſtabliſhment of this anniverſary. Upon the whole, we are inclined to believe, that the Arabs, notwithſtanding all the fine things recorded of them by their own poetical hiſtorians, and believed perhaps too eaſily by thoſe of other countries, were in the days of ignorance like the earlieſt Romans, *latrones et ſemibarbari*. For our part, we think it by no means probable, that a people of that character ſhould, after ſo long a courſe of years, have ſtumbled upon ſo laudable and ſo beneficial an inſtitution, without taking the hint from ſome foreign one of a ſimilar complexion. This we acknowledge is only a conjecture, and as ſuch it is ſubmitted to the judgment of the reader.

There were, as has been obſerved above, two principal dialects of the original Arabic: The Hamyarite ſpoken by the genuine Arabs, and the Koreiſhite or pure Arabic, which at laſt became the general language of that people. The former of theſe inclined towards the Syriac or Chaldean; the latter being, according to them, the language of Iſhmael, was deeply tinctured with the Hebrew idiom. The oriental writers tell us that Terah, the grandfather of Hamyar, was the firſt whoſe language deviated from the Syriac to the Arabic. Hence, ſay they, the Hamyaritic dialect muſt have approached nearer to the purity of the Syriac, and of conſequence muſt have been more remote from the true genius of the Arabic than that of any of the other tribes. The fact ſeems to ſtand thus: The Hamyarites were neighbours to the Chaldeans and Syrians, and conſequently were connected with thoſe people by commerce, wars, alliances, &c. This circumſtance introduced into their language many phraſes and idioms from both theſe nations. That Terah was concerned in adulterating the dialect of the Hamyarites, is a mere oriental legend, fabricated by the Arabs after they began to peruſe the Hebrew Scriptures. The Koreiſh being ſituated in the centre of Arabia, were leſs expoſed to intercourſe with foreigners, and therefore preſerved their language more pure and untainted.

46 The Koran written in the Koreiſh dialect.

The learned well know, that the Koran was written in the dialect of the Koreiſh; a circumſtance which communicated additional ſplendour to that branch of the Arabian tongue. It has been proved, that the language of the original inhabitants of Arabia was genuine Hebrew; but upon this ſuppoſition a queſtion will ariſe, namely, whether the Arabians actually preſerved their original tongue pure and unſophiſticated during a ſpace of 3000 years, which elapſed between the deluge and birth of Mohammed? or, whether, during that period, according to the ordinary courſe of human affairs, it underwent many changes and deviations from the original ſtandard?

The admirers of that language ſtrenuouſly maintain the former poſition; others, who are more moderate in their attachment, are diſpoſed to admit the latter. Chardin obſerves of the oriental languages in general, that they do not vary and fluctuate with time like the European tongues *. "Ce qu'il y a de plus admirable, dit il, et de plus remarquable, dans ces langues, c'eſt, qu'elles ne changent point, et n'ont point changé du tout, ſoi à l'égard de termes, ſoit à l'égard du tour: rien n'y eſt, ni nouveau ni vieux, nulle bonne façon de parler, n'a ceſſé *d'etre* en credit. L'Alcoran, par exemple, eſt aujourdhui, comme il y a mille années, le modele de plus pure, plus courte, et plus eloquente diction." It is not to our purpoſe to tranſcribe the remaining part of the author's reflection upon this ſubject: From the above it plainly appears that he concludes, that the Arabian tongue has ſuffered no change ſince the publication of the Koran; and at the ſame time inſinuates, that it had continued invariable in its original purity through all ages, from the days of Kobtan to the appearance of that book. Whether both or either of theſe ſentiments is properly authenticated will appear in the ſequel.

* Voyage, vol. iii. p. 43.

47 Means adopted by the Arabs to preſerve the purity of their language.

The learned Dr Robertſon, late profeſſor of oriental languages in the univerſity of Edinburgh, informs us, that the Arabians, in order to preſerve the purity of their language, ſtrictly prohibited their merchants, who were obliged to go abroad for the ſake of commerce, all commerce with ſtrange women. We know not where this injunction is recorded, but certainly it was a moſt terrible interdict to an amorous ſon of the deſert. If ſuch a prohibition actually exiſted, we ſuſpect it originated from ſome other ſource than the fear of corrupting their language. Be that as it may, the Doctor, as well as the great Schultens, is clearly of opinion, that the language in queſtion, though divided into a great number of ſtreams and canals, ſtill flowed pure and limpid in its courſe.

Our readers who are acquainted with the hiſtory of the orientals are already apprized of the ſteady attachment of thoſe people to ancient cuſtoms and inſtitutions. We readily allow, that in the article of Language this ſame predilection is abundantly obvious; but every oriental ſcholar muſt confeſs, that the ſtyle of the Koran is at this day in a manner obſolete, and become almoſt a dead language. This fact, we believe, will not be queſtioned. If the Arabian has deviated ſo very conſiderably from the ſtandard of the Koran in little more than 1000 years, and that too after an archetype is aſcertained; by a parity of reaſon we may infer, that much greater deviations muſt have affected the language in the ſpace of 3000 years.

48 The ſtyle of the Koran now obſolete.

It is univerſally allowed by ſuch as maintain the unſullied purity of the Arabian tongue, that it was originally the ſame with the Hebrew, or with the ancient Syriac and Chaldaic. Let any one now compare the words, idioms, and phraſeology of the Koran with the remains of thoſe three languages, and we think we may venture to affirm that the difference will be palpable. This circumſtance, one would think, indicates in the ſtrongeſt terms a remarkable alteration.

The Arabs themſelves are agreed, that, notwithſtanding the amazing fecundity of their language, vaſt numbers of its radical terms have been irrecoverably loſt. But this loſs could not be ſupplied without either fabricating new words or borrowing them from foreign languages. To the latter method we have ſeen their averſion;

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sion; and must therefore conclude that they adopted the former.

The Chaldeans, Syrians, and Phœnicians, had made innovations on their language at a very early period, even before conquests were undertaken: We see no reason to suppose that the Arabs did not innovate as well as their nearest neighbours: the Hamyarites did actually innovate.

There are, we think, very strong reasons to believe, that Job was an Arabian, and flourished prior to Moses, perhaps as early as Jacob. The style, the genius, the figurative tone of the composition; the amazing sublimity of the sentiments, the allusions, the pathos, the boldness, the variety, and irregularity, the poetical enthusiasm which pervades the whole poem, strongly breathe the Arabian spirit: indeed the very diction is peculiar to that single book, and differs widely from that of the

49 and resembling the Hebrew in its phraseology.

Psalms and every poetical part of the sacred canon. If we compare this book with Mohammed's Koran, we shall scarce find any resemblance of words or phraseology; but a wonderful similarity of figures, enthusiasm, and elevation of sentiments.

We are then led to conclude, that the Arabic did actually lose and gain a multitude of vocables between the era of its first establishment among the descendants of Joktan and Ishmael, and the birth of the impostor.

The art of writing was introduced among the Arabs at a very late period: Without the assistance of this art, one would think it altogether impossible to preserve any language in its primæval purity and simplicity. Our curious readers may here expect some account of the Arabic characters: the following detail is the most probable one we have been able to collect on that subject.

* Pococke's Specim. Hist. Arab.

50 Art of writing among the Hamyarites,

It is generally agreed*, that the art of writing was known among the Hamyarites or Homerites at a very early period. These people were sovereigns of Arabia during a course of many ages. Their character was somewhat perplexed and confused. It was called *al Mosnad*, from the mutual connection of the letters. The alphabet of these people resembled that of the Hebrews both in the number and order of the letters, and is called *abgad hevis* †, from the first ten letters of the Hebrew alphabet, artificially thrown together. "And this word (says the learned Chardin ‡) *a*, *b*, *g*, *d*, is formed of the four letters which were heretofore the first in the Arabian language, as they are still in that of the Hebrews." The same traveller is positive that these were the ancient characters of the Arabs; that they differed from Cuphite letters, which were afterwards introduced; and that they were furnished with vowel points. These, we imagine, were the first sketches of the Chaldean character, which probably the Hamyarites retained in their pristine unpolished form, after they had been polished and reduced to a more elegant size by the original inventors.

† Ib. ibid.

‡ Vol. iii. p. 153.

Monuments bearing inscriptions in these characters are, they tell us, still to be seen in some places of Arabia. Some were engraved on rocks; and to these we think it probable that the patriarch Job alludes in those passages where he seems to intimate an inclination to have his sufferings recorded in a book, and graven in the rock for ever. All the Arabians agree, that the dialect of the Hamyarites inclined towards the Syriac or Chaldean. This we have imputed to the connection of that people with the Chaldeans, who lived in their neighbourhood. If the Hamyaritic dialect was infected with the Syriac or Chaldaic, there can be no doubt that they derived their letters from the same quarter.

We conclude then, that the Hamyarites knew the art of writing from the earliest antiquity, and that the letters they employed were the rude Chaldaic in their unimproved state *. Some of the Arabians do indeed hold, that Ishmael was the first author of letters; but that his characters were rude and indistinct, without any interval between letters or words, and that these were adopted by Kedar and his other children: but this tradition hath met with little credit.

51 in Chaldaic characters.

* Pococke Orat. de Ling. Arab.

With respect to the highly polished Koreishites, it is agreed on all hands, that they were unacquainted with the use of letters till a few years before the birth of Mohammed. Two difficulties here present themselves. The first is, how the Koreishite dialect, without the art of writing, happened to excel all the other dialects of the Arabic tongue, assisted by that art, apparently so necessary for preserving a language in its original purity. The second is still, we think, rather greater, namely, how the Koreish learned that most useful art at so late a period as the sixth century. It is a well-known fact, that ever after the Babylonish captivity Arabia swarmed with Jewish villages, in which the art of writing was generally known; and almost at the beginning of the Christian era, multitudes of Christians retired to the same country, in order to avoid the persecutions which they suffered in the Roman empire. In these circumstances, we think it rather strange, that the Koreishites, highly polished and acute as they were, never thought of laying hold on the opportunity of learning an art so very useful. These two problems we leave to be solved by our more learned readers.

52 Art of writing among the Koreishites.

But however they be solved, it is universally acknowledged, that the Koreish were ignorant of letters till a few years before the birth of their prophet. Ebn Challican (B), one of their most celebrated historians, informs us, that Moramer the son of Morra, an Anbarian, a native of Anbaris, a city of Irak (C), first invented alphabetical characters, and taught his countrymen to use them, from whom this noble invention was derived to the Koreishites. These letters, though neither beautiful nor convenient, were long used by the Arabs. They were denominated *Cuphite*, from *Cupha*, a city of Irak. In this character the original copy of the Koran was written. These we think were the original clumsy characters which were retained by the vulgar, after the beautiful square Chaldaic letters were invented, and probably used by priests, philosophers, and the learned

(B) See this whole detail in Dr Pococke's *Specim. Hist. Arab.* p. 250. *et seq.*

(C) *Irack*, "Babylonia," from *Erech*, one of the cities built by Nimrod. The Arabians have generally restored the ancient names of places. Thus with them Tyre is *Tzur*, Sidon *Seyd*, Egypt *Mezri*, &c.

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learned in general. Thefe letters are often at this day ufed by the Arabs for the titles of books and public infcriptions.

* Robertf. Clav. Pent. p. 35, 36.

53 Improved about 300 years after Mohammed.

Abauli the fon of Mocla *, about 300 years after the death of Mohammed, found out a more elegant and more expeditious character. This invention of Abauli was afterwards carried to perfection by Ebn Bowla, who died in the year of the Hegira 413, when Kader was caliph of Bagdad. This character, with little variation, obtains at this day. As we think this article of fome importance, we fhall, for the fake of our unlearned readers, tranfcribe an excellent account of this whole matter from the very learned Schultens.

"The Cuphic character, fays he, which had been brought from the region of the Chaldeans to the province of Hejaz, and to Mecca its capital, in the age of Mohammed, was employed by the Koreifhites, and in it the Koran was firft written. But as this character was rude and clumfy, in confequence of its fize, and ill calculated for expedition, Abauli Ebn Mocla devifed a more elegant and expeditious one. This perfon was vifir to Arradius the 41ft caliph, who began to reign in the year of the Hegira 322. Accordingly, in the 10th century, under this emperor of the Saracens, the form of the Arabian alphabet underwent a change; and the former clumfy embarraffed character was made to give way to the polifhed, eafy, and expeditious type. Regarding this expedition alone, the author of the invention left very few vowel characters; and as the Hebrew manner of writing admits five long ones and five fhort in different fhapes, he taught how to exprefs all the vowels, both long and fhort, fuitably to the genius of the language, by three, or rather by two, fmall points, without any danger of a miftake: an abbreviation truly deferving applaufe and admiration; for by placing a very fmall line above ◡ he expreffed *a* and *e*; and by placing the fame below ◡ he meant to intimate *i* only. To the other fhort ones, *o* and *u*, he affigned a fmall *waw* above. In order to reprefent the long ones, he called in the *matres lectionis*, the "quiefcent letters א, ו, י;" fo that *phata* with *elif* intimated *a* and *o* long, i. e. *kametz* and *cholem*; *jod* placed after *kefram* became *tzeri* and *chirek* long. *Waw* annexed to *damma* made *fchurek*."

In this paffage, the great orientalift acknowledges that the vifir above mentioned, who carried the Arabian alphabet to the pinnacle of perfection, invented and annexed the vowel points for the fake of eafe and expedition in writing; from which we may infer, that prior to the tenth century the Arabians had no vowel points; and confequently either read without vowels, or contented themfelves with the *matres lectionis* above mentioned.

The defign of the author of the invention, in fabricating thefe points, was confeffedly eafe and expedition in writing; a circumftance which furnifhes a violent prefumption that the Hebrew vowel-points were devifed and annexed at fome late period for the very fame purpofes.

Some, indeed, have gone fo far as to affirm that the Arabians were the original fabricators of the vowel-points. "The Arabians † (fays the learned Dr Gregory Sharp) were the original authors of the vowel-points. They invented three, called *fatha*, and *damma*, and *kefra*: but thefe were not in ufe till feveral years

† Diff. on the Origin of Lan. &c.

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after Mohammed; for it is certain that the firft copies of the Koran were without them. The rabbis ftole them from the Arabs." This, however, is carrying the matter too far, fince it is certain that the Jews were acquainted with the points in queftion long before the period above mentioned.

Though it is not our intention to enter into a minute detail of the peculiarities of this noble language, we cannot omit obferving one thing, which indeed belongs to grammar, but is not generally taken notice of by the Arabic grammarians. The roots of verbs in this dialect are univerfally triliteral; fo that the compofition of the 28 Arabian letters would give near 22,000 elements of the language. This circumftance demonftrates the furprifing extent of it: for although great numbers of its roots are irrecoverably loft, and fome perhaps were never in ufe; yet if we fuppofe 10,000 of them, without reckoning quadriliterals, to exift, and each of them to admit only five variations, one with another, in forming derivative nouns, the whole language would then confift of 50,000 words, each of which may receive a multitude of changes by the rules of grammar.

54 Surprifing extent of the Arabic language.

Again, the Arabic feems to abhor the compofition of words, and invariably expreffes very complex ideas by circumlocution; fo that if a compound word be found in any dialect of that language, we may at once pronounce it of foreign extraction. This is indeed a diftinguifhing feature in the ftructure of this tongue, as well as of fome of its fifter dialects. This circumftance has, in our opinion, contributed not a little to the amazing fecundity of that language: for as every ingredient in the compofition of a complex idea requires a word to exprefs it, as many words became neceffary to complete the language as there were fimple ideas to be intimated by difcourfe. Were all the compounds of the Greek language to be diffolved, as probably once they were, the vocables of that tongue would infinitely exceed their prefent number.

The Arabic authors boaft moft unconfcionably of the richnefs and variety of their language. No human underftanding, fay they, is capacious enough to comprehend all its treafures. Infpiration alone can qualify one for exhaufting its fources *. Ebn Chalawalb, a moft renowned grammarian of theirs, has fpent a whole volume upon the various names of the lion, which amount to 500; another on the names of the ferpent, which make up 200. Mohammed al Firancabodius affirms that he wrote a book on the ufefulnefs and different denominations of honey, in which he enumerates 80 of them; and after all, he affures us that he was ftill far from having exhaufted his fubject. To excel in a language fo amazingly copious, was certainly a proof of uncommon capacity, and confidered as no mean talent even among the Koreifhites. Hence Mohammed, when fome people were expreffing their admiration of the eloquence of the Koran, told them that he had been taught by the angel Gabriel the language of Ifhmael, which had fallen into defuetude.

* Pococke's Specimen.

55 Oratory and poetry of the Arabs.

In a language fo richly replenifhed with the choiceft and moft energetic terms, both oratory and poetry were cultivated with eafe. All the difficulty confifted in making a choice among words and phrafes equally elegant. We may compare one of thofe poets or orators to a young gentleman, of a tafte highly refined, walking into a repofitory where a profufion of the richeft and

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and most elegant dresses are piled up in wild confusion. Our beau is here distressed with variety; but to be able to choose the most handsome and most becoming, he must have received from nature a superior good taste; which he must likewise have cultivated by assiduous industry, and by associating with the most genteel company.

The orations of the Arabs were of two kinds, metrical and prosaic. The former they compared to pearls set in gold, and the latter to loose ones. They were ambitious of excelling in both; and whoever did so, was highly distinguished. His success in either of those departments was thought to confer honour, not only on his family, but even on his tribe. In their poems were preserved the genealogies of their families, the privileges of their tribes, the memory of their heroes, the exploits of their ancestors, the propriety of their language, the magnificence of banquets, the generosity of their wealthy chiefs and great men, &c. After all, we cannot avoid being of the unpopular opinion, that this mighty parade of eloquence and poetry did not reach backward above two centuries before the birth of Mohammed, as it certainly vanished at the era of the propagation of his religious institutions. The two succeeding centuries were the reigns of superstition and bloodshed. The voice of the muses is seldom heard amidst the din of arms.

The ancient Arabs, at whatever time poetry began to be in request among them, did not at first write poems of considerable length. They only expressed themselves in metre occasionally, in acute rather than harmonious strains. The Proverbs of Solomon, and the book of Ecclesiastes seem to be composed in this species of versification. The prosody of the Arabs was never digested into rules till some time after the death of Mohammed; and this is said to have been done by Al Khalil al Farahidi, who lived in the reign of the caliph Harun al Raschid.

After so many encomiums on the copiousness of the Arabic tongue, one class of our readers may possibly expect that we should subjoin a brief detail of its genius and character; and this we shall do with all possible brevity.

56
Genius and character of the language.

All the primary or radical words of the language are composed of different combinations of consonants by *triads*; so that the various combinations and conjunctions of radicals make more than 10,000, even without including those which may arise from the meeting of guttural letters. From this quality of the language has flowed that stability of the dialect which has preserved it pure and entire for so many thousand years, and secured it from those changes and that fluctuation to which most other tongues are subject.

Perhaps, notwithstanding its copiousness and variety, no other language can vie with the one in question in point of perspicuity and precision. It is possessed of a brevity and rotundity which, amidst the greatest variety, enables it to express with clearness and energy what could not be expressed in any other tongue without tedious circumlocutions. To this purpose we shall beg leave to transcribe a passage from Bishop Pococke's oration on the Arabic language. As we imagine few of our readers who will have the curiosity to peruse this article can be unacquainted with the Latin tongue, we shall give it as it stands in the original, without a translation:

"Neque in nulla certe laudis parte, mira illa qua, non solum verborum in significando, perspicuitate, sed in prolatione, elegantiæ et dulcedini caverunt, sedulitas; quoque, non solum accurata, inter literas ex significata proportione, sensus vel intensioni, vel remissioni, prout res postulaverit, literarum appositione, subductione, vel juxta organorum, rationem prospexerunt; sed et ne quid delicatulis auribus ingratum, ne quid horridum, aut ἀσυμφωνον, reperiatur, effecerunt. Hoc in genere est, quod nuspiam in verbo aliquo, genuinæ apud Arabes originis, concurrunt, non intercedente vocalis alicujus motione consonantes, cum vel tres, vel plures, aliis in linguis frequenter collidantur. Immo neque, si adsint, quæ asperitati remedio sint, vocales, quas libet temerè tamen committunt consonantes; sed ita rei natura postulat, ut concurrere debeant illa, quæ se invicem, sine asperitatis inductione consequi, et inter se connecti non possint; illi vel situs, vel literarum mutatione, eas abjiciendo, inserendo, emolliendo, aliisve quibus possent modis, remedia quærunt; adeo ab omni, quod vel absonum, vel dissonum est, abhorrent. Quod si nobis secus videntur, et asperius sonare ab Arabibus prolata, illud auribus nostris, et usui, non linguæ imputandum, nec mollius illis sonare nostra, quam eorum nobis censendum. Quin et gutturalium, quæ nobis maxima asperitatis causa videntur, absentiam, ut magnum in lingua Græca defectum, arguunt Arabes."

The learned Dr Hunt, late professor of the Hebrew and Arabic languages at Oxford, is of the same opinion with the very learned prelate, part of whose oration we have transcribed above, with respect to the delicacy and elegance of the Arabian language:—"Nusquam, mihi credite, (inquit ille) auribus magis parcitur quam in Arabia; nulla lingua à κακοφωνια, alienior quam Arabica. Quamquam enim nonnullæ ejus literæ minus fortasse suaviter, immo durius etiam sonuerint, ita tamen Arabes eas temperarunt cum lenibus, duras cum mollibus, graves cum acutis miscendo, voces inde non minus auribus jucundæ, quam pronunciatu faciles confecerint, totique sermoni miram sonorum tam dulcedinem quam varietatem addiderint. Quod quidem orationis modulandæ studium in Corano adeo manifestum est, ut primi Islamismi oppugnatores eum librum magica ideo arte scriptum dixerint. Non auribus tantum gratus est Arabismus, sed et animi conceptibus exprimendis aptus, sonos suos sententiis semper accommodans, et felici verborum junctura eorum naturam depingens."

To these we might add quotations from Erpenius's oration on the same subject, from Golius, Schultens, Hottinger, Bochart, and Sir William Jones; besides a whole cloud of oriental witnesses, whose extravagant encomiums would rather astonish than edify the far greater part of our readers. These panegyrics may perhaps be in some measure hyperbolical; but in general we believe them pretty well founded. At the same time we are convinced that the Arabic, however melodious in the ears of a native, sounds harsh and unharmonious in that of an European.

When we consider the richness and variety of the Arabic tongue, we are led to conclude, that to acquire a tolerable degree of skill in its idioms, is a more difficult task than is generally imagined; at least some people 57 Difficulty of acquiring a thorough knowledge of it.

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people who have acquired the knowledge of the Greek and Latin, and likewise of the more fashionable modern languages, with facility enough, have found it so. Be that as it may, there are two classes of men who, in our opinion, cannot handsomely dispense with the knowledge of that almost universal tongue: the gentleman, who is to be employed in the political transactions of the most respectable mercantile company upon earth, in the eastern parts of the world; and the divine, who applies himself to investigate the true purport of the sacred oracles: without this, the former will often find himself embarrassed in both his civil and mercantile negociations; and the latter will often grope in the dark, when a moderate acquaintance with that tongue would make all sunshine around him.

Bochart, Hottinger, Schultens, Pocock, Hunt, and Robertson, &c. have taken wonderful pains, and lavished a profusion of learning, in proving the affinity and dialectical cognation between the Hebrew and Arabic. Much of this labour, we think, might have been spared. We presume to affirm, that no person tolerably versed in both languages can read a single paragraph of the Arabic version of the New Testament, or indeed of the Koran itself, without being convinced of the truth of this position: it is but stripping the latter of its adventitious frippery, and the kindred features will immediately appear.

The learned professors of the university of Leyden were the first who entered upon the career of Arabian learning. To them the European students are principally indebted for what knowledge of that language they have hitherto been able to attain. Though several Italians have contributed their endeavours, yet the fruit of their labours has been rendered almost useless by more commodious and more accurate works printed in Holland.

The palm of glory, in this branch of literature, is due to Golius, whose works are equally profound and elegant; so perspicuous in method, that they may always be consulted without fatigue, and read without languor. Erpenius's excellent grammar, and his memorable dictionary, will enable the student to explain the history of *Taimur* by *Ibni Arabshah*. If he has once mastered that sublime work, he will understand the learned *Arabic* better than most of the Khatabs of Constantinople or of Mecca.

The Arabian language, however, notwithstanding all its boasted perfections, has undoubtedly shared the fate of other living languages; it has gradually undergone such considerable alterations, that the Arabic spoke and written in the age of Mohammed may be now regarded as a dead language: it is indeed so widely different from the modern language of Arabia, that it is taught and studied in the college of Mecca just as the Latin is at Rome.

The dialect of the Highlands of Yemen is said to have the nearest analogy to the language of the Koran, because these Highlanders have little intercourse with strangers. The old Arabic is through all the East, like the Latin in Europe, a learned tongue, taught in colleges, and only to be acquired by the perusal of the best authors.

"*Ut folia in sylvis pronos mutantur in annos, &c.*"

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SECT. III. *Of the Chaldean, Phœnician, Ethiopian or Abyssinian, and Egyptian Languages.*

68 Connection of the Chaldee, Phœnician, Ethiopic, and Egyptian languages.

As there is a very strict connection and dialectical analogy among these languages, we have arranged them all under one section; especially since what is observed relating to one of them may, without the least straining, be extended to them all. We shall begin with the Chaldaic.

The Chaldeans, or Chasidim, as they are always [illegible]ed in Scripture, were the descendants of Chesed the son of Nahor, the brother of Abraham. The descendants of this patriarch drove the Cushim or Arabians out of Babylonia, and possessed themselves of that country at a very early period. As these Chasidim or Chaldeans were the posterity of Nahor, the descendant of Heber, they undoubtedly spoke the original Hebrew tongue as well as the other branches of that family. But being an ingenious inventive people, they seem to have polished their language with much care and delicacy of taste.

The only genuine remains of the ancient Chaldaic language are to be found in the Hebrew Scriptures; and those are contained in 268 verses, of which we have 200 in Daniel, reaching from verse 4th chapter 2d to chapter 8th exclusive; in Ezra 67, in chapter 4th, 17 verses; chapter 5th, the same number; chaptor 6th, 18 verses; and in chapter 7th, 15: in Jeremiah, chapter 10th, there is extant only one verse. From these fragments, compared with the Hebrew, it plainly appears, that the difference between that language and the Chaldaic is scarce equal to that between the Doric and Ionic dialects of the Greek.

Whatever might have been the form of the most ancient Chaldaic letters, it is generally known that the beautiful square characters, in which the Hebrew Scriptures began to be written after the age of Ezra, were current among them at an era prior to the Babylonish captivity. Those elegant characters were probably the invention of the Chaldean academies, which were established in various parts of that extensive and fertile country.

69 Chaldean differs little from the Hebrew.

The Chaldean declensions and conjugations differ so little from the Hebrew modifications, that it would be almost superfluous to dwell upon them in this section. The most effectual way to acquire an idea of the ancient Chaldaic, is to decompound the names confessedly of that dialect, which occur in many places of Scripture. By this method of proceeding, its beautiful structure and expressive energy will be readily comprehended even by the most illiterate classes of our readers. At the same time, we must observe, that the Chaldaic and ancient Syriac bore so near a resemblance to each other, that they have generally been classed under one head.

The first Chaldaic word that occurs in the Old Testament is *bara* "*creavit.*" This word has all along been assigned to the language under consideration; for what reason, we confess we are not able to discover. The greatest part of the Hebrew tongue is now lost. The words *bar*, "a son," and *bara* "*creavit*," (rather *filiavit*), may probably be of that number. Another Scripture word which is often quoted, and always ascribed either to the Syriac or Chaldaic, is *igar* or *jegar sahadutha*,

Chaldean Language, &c. *ſahadutha*, which ſignifies "a monument of witneſſes." Every body knows, that when Jacob and Laban made their compact, the latter denominated the heap of ſtones reared upon that occaſion in this manner; while the formed called it *Galeed*, as we now write and pronounce it. This pronunciation, however, does not appear to us altogether genuine. The word is probably compounded of גל, *gal*, *cumulus*, "a heap," and עד, *chad*, *æternitas*, *ſeculum*, "eternity, an age:" ſo that גלעד, *galchad*, or *galaad* as it came to be written afterwards, ſignified an "everlaſting heap." Laban then had reſpect to the end for which the monument was erected; but Jacob alluded to its duration. It appears, however, upon this and every other occaſion, when Chaldaic words are mentioned, that א, *a*, was a favourite letter both with the Syrians and Chaldeans. We may likewiſe obſerve, that the ſame people always changed the Hebrew ש, *ſhin*, into ת, *thau*, in order to avoid the ſerpentine ſound of that conſonant.

60 Its proper names pure Hebrew. The Chaldaic names of gods, men, places, &c. which occur in Scripture, appear to be no other than Hebrew poliſhed and improved. *Bel*, *Belus* in Latin, is evidently בעל, *Baal*, or we think rather ב-על, *Bechel*. The Phœnicians, and ſometimes the Hebrews, uſed it to ſignify *the moſt high*. The Chaldeans uſed their word *Bel* for the ſame purpoſe; and becauſe this word originally imported the *High One*, they dignified their firſt monarch with that name. They denominated their capital city *Ba-Bel*, which imports the *temple of Bel*, and afterwards *Babylon*, which intimates *the abode or dwelling of our lord the ſun*. *Nebo* was a name of the moon among the Babylonians, derived from the Hebrew נבא, *nabah*, *vaticinari*, "to prophecy." *Azer* was the planet Mars, from אזר, *Azer* or *Ezur*, *accinxit*, "to gird," alluding to the girding on of arms. *Ahad* was an Aſſyrian name of the ſun *, a word deduced from the Hebrew אחד, *ahad*, *unus*, "one." *Netzar* was the name of an Arabian idol †, which often occurs in the compoſition of Babylonian names. In Arabic it ſignifies an *eagle*: we think, however, that the word is the Hebrew נצר, *natzar*, *cuſtodivit*, *ſervavit*, "to keep, to preſerve." To theſe names of deities many more might be added, which the nature of our deſign will not allow us to mention.

* *Merob.* lib. i. c. 23.

† *Pococke Specim. Hiſt. Arab.*

Almoſt all the Chaldean proper names which occur either in ſacred or profane hiſtory are evidently of Hebrew original, or cognate with that language. We ſhall ſubjoin a few examples: *Nabonaſſar* is evidently compounded of *Nabo* and *nazur*, both Hebrew words. *Nabopollazar* is made up of *Nabo-Pul*, the ſame with *Bel*, and *Azer* or *Azor*, above explained. *Beleſis* is made up of *Bel* and אשא, *Eſha*, "fire." Nebuchadnezzar, Belſhazzar, Beltiſhazzar, Nerigliſſar, Nebuzaradan, Rabmag, Rabſaris, Nergal Sharezer, Rabſhakeh, Ezarhaddon, Merodach, Evil Merodach, and numberleſs others, are ſo manifeſtly reducible to Hebrew vocables, when decompounded, that the oriental ſcholar will readily diſtinguiſh them.

Names of places in the Chaldaic are likewiſe ſo nearly Hebrew, that nothing but the dialectical tone ſeparates them. Thus *Ur* of the Chaldeans is actually אור, *light*, that city being ſacred to the ſun: *Sippora* is plainly the Hebrew word *Zipporah*; *Carchemiſh*, a city on the Euphrates, is evidently compounded of *Kir* or *Kar*, "a city," and *Chemoſh*, a name of the ſun. In ſhort, every Chaldean or old Syrian word now extant, without any difficulty, bewray their Hebrew original. As for their dialectical differences, theſe we remit to the Chaldaic grammars and lexicons.

61 Phœnician language derived from the Hebrew. We now proceed to the conſideration of the Phœnician language, which is known to have been that of the ancient Canaanites. That this was one of the original dialects, and conſequently a cognate of the Hebrew, is univerſally acknowledged. Inſtead therefore of endeavouring to prove this poſition, we may refer our readers to the works of the learned Mr Bochart, where that author has in a manner demonſtrated this point, by deriving almoſt all the names of the Phœnician colonies from the Hebrew, upon the ſuppoſition that the dialect of thoſe people was cloſely connected with that tongue. St Auguſtine, *de Civitate Dei*, has obſerved, that even in his time many of the vulgar in the neighbourhood of Carthage and Hippo ſpoke a dialect of the old Punic which nearly reſembled the Hebrew. Procopius, *de bello Goth.* informs us, that there exiſted even in his days in Africa a pillar with this inſcription in Hebrew, "We flee from the face of Joſhua the robber, the ſon of Nun." The names of all the ancient cities built by the Carthaginians on the coaſt of Africa are eaſily reducible to a Hebrew original. The Carthaginian names of perſons mentioned in the Greek and Latin hiſtory, ſuch as Himilco, Hamilcar, Aſdrubal, Hannibal, Hanno, Dido, Anna or Hannah, Sophoniſba, Giſgo, Maharbal, Adherbal, &c. all breathe a Hebrew extraction.

The Greeks borrowed a great part of their religious worſhip from the people of whoſe language we are treating; of conſequence, the names of moſt of their gods are Phœnician. Almoſt every one of theſe is actually Hebrew, as might eaſily be ſhown. The names of perſons and places mentioned in the fragments of Sanchoniathon, preſerved by Euſebius, are all of Hebrew complexion. The names mentioned in the Hebrew ſcriptures of places which belonged to the Canaanites prior to the invaſion of the Iſraelites under Joſhua, are as much Hebrew as thoſe which were afterwards ſubſtituted in their ſtead. The Punic ſcene in Plautus has been analyſed by Bochart and ſeveral other learned men, by whom the language has been clearly proved to be deduced from the Hebrew, with ſome dialectical variations.

The iſland of Melita (now Malta) was inhabited by a colony of Phœnicians many ages before the Moors took poſſeſſion of it. Among the vulgar of that iſland many Punic vocables are current to this day, all which may be readily traced up to the Hebrew fountain. To theſe we may add many inſcriptions on ſtones, coins, medals, &c. which are certainly Phœnician, and as certainly of Hebrew extraction. We have thrown together theſe few hints without purſuing them to any great length, as we deemed it unneceſſary to dwell long on a point ſo hackneyed and ſo generally acknowledged.

62 Origin of the Ethiopians. Before we proceed to treat of the ancient language of the Ethiopians, we find ourſelves obliged to hazard a few ſtrictures on the origin of that ancient nation. If we can once ſettle that ſingle point, the diſcovery will open an avenue to their primitive dialect, the article about which we are chiefly concerned in the preſent diſcuſſion.

In our Section concerning the Hebrew language, we were led often to mention the patriarch Cuſh the eldeſt ſon of Ham. The poſterity of this family chief, under his

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his son Nimrod, possessed themselves of Shinar, afterwards denominated *Chaldea*. These were probably the Arabians whose kings (according to Eusebius, Africanus, and other ancient chronologers) reigned in Babylon during several successive generations. Those were the Cushim or Cushites, whom the learned Mr Bryant has conducted over a great part of the world, and to whose industry and ingenuity he has ascribed almost all the inventions, arts, sciences, laws, policy, religions, &c. which distinguished mankind in the earliest ages.

In process of time, the posterity of Chasid or Chesed, called *Chasdim* or *Chasidim*, in the east, and *Chaldeans* in the west, drove out the Cushim, and seized upon their country. The Cushim retired westward, and spread themselves over that part of Arabia situated towards the south-east. They probably extended themselves over all the eastern part of that peninsula from the sea to the wilderness between Arabia and Syria. Those were the Ethiopians mentioned in Scripture by a very unpardonable inadvertency of our translators. These, then, we think, were the primitive Cushim.

Josephus informs us*, that all the Asiatics called the Ethiopians of Africa by the name of *Cushim*. This denomination was not given them without good reason: it imports at least, that they deemed them the descendants of Cush; it being the constant practice of the orientals in the early ages to denominate nations and tribes from the name of their great patriarch or founder. The name *Cushim* must then have been given to the Ethiopians, from a persuasion that they were the progeny of the son of Ham who bore that name. By what route soever the Cushim penetrated into that region of Africa which was called by that name, it may be taken for granted that they were the descendants of Cush above mentioned.

* *Antiq. Jud.* lib. i. c. 7.

It has been observed above, that the posterity of Cush possessed the country of Shinar or Chaldea at a very early period, but were expelled by the Chasidim or Chaldeans. Upon this catastrophe, or perhaps somewhat later, a colony from the fugitive Cushim transported themselves from the south and south-east coast of Arabia over the sea which lies between that country and Ethiopia. However imperfect the art of navigation might be in that age, the distance was so small that they might easily enough make a voyage cross that narrow sea in open boats, or perhaps in canoes. However that may have been, it cannot be doubted that the tribes on both sides of that branch of the sea were kindred nations.

63 Their language originally Chaldean.

If, then, both the northern and southern Cushim sprung from the same stock, there can be no doubt that both spoke the same language. The language of the Babylonian Cushim was Chaldaic, and of consequence that of the Ethiopian Cushim was the same. We may therefore rest assured, that whatever changes the Ethiopian dialect may have undergone in the course of 3000 years, it was originally either Chaldaic, or at least a branch of that language. Scaliger informs us, that the Ethiopians call themselves Chaldeans; and that, says he, not without reason, because of those many sacred and profane books which are extant among them, the most elegant and most beautiful are written in a style near that of the Chaldean or Assyrian. Marianus Victorius, who was the first that reduced the Ethiopic tongue to the rules of grammar, tells us, in his *Proœmium*, "that the Ethiopians call their tongue Chaldaic; that it springs from the Babylonian; and is very like the Hebrew, Syriac, and Arabic: At the same time (he concludes), that this language may be easily learned by those who are masters of the Hebrew." The learned Bochart, and Bishop Walton in his *Proleg*. are clearly of the same opinion.

The vulgar letters of the Ethiopians, according to Diodorus Siculus, were the same with the sacred † characters of the Egyptians (D). From this account, if the Sicilian may be trusted, the sacred letters of these people, concerning which so many wild conjectures have been formed, were actually Chaldaic. To carry on this investigation a little farther, we may observe, that Sir William Jones seems to have proved, by very plausible arguments, that the Sanscrit characters were deduced from the Chaldaic. This circumstance affords a presumption that the Ethiopian Cushim were likewise concerned with the Egyptians; who, as is remarked in the Section concerning the *Sanscrit*, probably introduced the religion of the Brahmans into Hindostan. This is advanced as a conjecture only; and yet when we consider the affinity between the Egyptian and Gentoo religions, we are strongly inclined to hope that this surmise may one day be verified by undeniable facts.

† Lib. iii. p. 101. *Steph.*

64 Ancient intercourse between the Ethiopians and Egyptians.

The original Ethiopians were a people highly civilized; their laws, their institutions, and especially their religion, were celebrated far and wide. Homer talks in raptures of the piety of the Ethiopians, and sends his gods every now and then to revel 12 days with that devout people. The Sicilian adduces a number of very specious arguments to prove that these two nations had sprung from the same stock. He mentions a similarity of features, of manners, of customs, of laws, of letters, of the fabrication of statues, of religion, as evidences of the relation between those two neighbouring nations. There was, every body knows, a communion, as to sacred rites, between the two countries. The Egyptians sent annually a deputation of their priests, furnished with the portable statues of their gods, to visit the fanes of the devout Ethiopians. Upon this occasion, a solemn religious banquet was prepared, which lasted 12 days, and of which the priests of both nations were partakers. It was, we imagine, a kind of sacramental institution, by which both parties publicly avouched their agreement in the ceremonies of their religion respectively. These observations plainly show, that the most ancient Ethiopians were a people highly civilized; indeed so much, that the Egyptians were at one time contented to be their scholars. The tone of their language was certainly the same with that of the Chaldeans or Arabian Cushim, from whom they are descended. We know not whether there are any books in the ancient Ethiopic now extant; so that it is not easy to produce instances of its coincidence with the Chaldaic. Diogenes Laertius* informs us, that Thrasyllus, in his catalogue

* Lib. ix. p. 461. *Casaub.*

(D) We find the same observation confirmed by Heliodorus (*Ethiop.* lib. x. p. 476.). "The royal letters of the Ethiopians (says he) were the sacred characters of the Egyptians." Cassiodorus likewise assures us, "That the letters inscribed upon the Egyptian obelisks were Chaldean." See Sect. *Sanscrit.*

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talogue of the books composed by Democritus, mentions one, *περι των εν Μεροη ιερων γραμματων, concerning the sacred letters in the island of Meroe* (E); and another concerning the sacred letters in Babylon. Had these books survived the ravages of time, they would in this age of research and curiosity have determined not only the point under our consideration, but the affinity of sacred rites among the Chaldeans, Ethiopians, and Egyptians.

We have now shown that the Ethiopians were a colony of Cushites; that the Cushites were originally sovereigns of Shinar or Chaldea, and consequently spoke either Chaldaic, or a dialect of that tongue; that their colonists must have used the same language; that the ancient Ethiopians were a people highly polished, and celebrated in the most early ages on account of their virtue and piety. It has likewise appeared that the common letters of that people were the sacred characters of the Egyptians. These letters, we imagine, were the Cuphite; for which see the section on the *Arabic*. When they were discarded, and the modern substituted in their room, cannot be determined; nor is it, we apprehend, a matter of much importance. We shall therefore drop that part of the subject, and refer our curious and inquisitive readers to the very learned Job Ludolf's (F) excellent grammar and dictionary of the Abyssinian or Geez tongue, where they will find every thing worth knowing on that subject. We shall endeavour to gratify our readers with a very brief account of the modern Ethiopic or

65 Modern Ethiopic tongues.

Abyssinian tongue; for which both they and we will be obliged to James Bruce, Esq. that learned, indefatigable, and adventurous traveller; who, by his observations on that country, which he made in person, often at the hazard of his life, has discovered, as it were, a new world both to Europe and Asia.

The most ancient language of Ethiopia, which we shall now call *Abyssinia* (its modern name), according to that gentleman, was the *Geez*, which was spoken by the ancient Cushite shepherds. This, we should think, approaches nearest to the old Chaldaic. Upon a revolution in that country, the court resided many years in the province of Amhara, where the people spoke a different language, or at least a very different dialect of the same language. During this interval, the *Geez*, or language of the shepherds, was dropt, and retained only in writing, and as a dead language: the sacred Scriptures being in that tongue only saved it from going into disuse. This tongue is exceedingly harsh and unharmonious. It is full of these two letters D and T, in which an accent is put that nearly resembles stammering. Considering the small extent of sea that divides this country from Arabia, we need not wonder that it has great affinity with the Arabic. It is not difficult to be acquired by those who understand any other of the oriental languages; and as the roots of many Hebrew words are only to be found here, it seems to be absolutely necessary to all those who wish to obtain a critical skill in that language.

66 Ethiopic alphabet.

The Ethiopic alphabet consists of 26 letters, each of which, by a *virgula* or point annexed, varies its sound in such a manner as that those 26 form as it were 62 distinct letters. At first they had but 25 of these original letters, the Latin P being wanting: so that they were obliged to substitute another letter in its place. *Paulus*, for example, they call *Taulus*, *Aulus*, or *Caulus*: *Petros*, they pronounced *Ketros*. At last they substituted T, and added this to the end of their alphabet; giving it the force of P, though it was really a repetition of a character rather than the invention of a new one. Besides these, there are 20 others of the nature of diphthongs; but some of them are probably not of the same antiquity with the letters of the alphabet, but have been invented in later times by the scribes for convenience.

The Amharic, during the long banishment of the royal family in Shoa, became the language of the court, and seven new characters were of necessity added to answer the pronunciation of this new language; but no book was ever written in any other language than *Geez*. There is an old law in the country, handed down by tradition, that whoever shall attempt to translate the Holy Scripture into Amharic or any other language, his throat shall be cut after the manner in which they kill sheep, his family sold to slavery, and their houses razed to the ground.

Before we leave this subject, we may observe, that all the ancients, both poets and historians, talk of a double race of Ethiopians; one in India, and another in Africa. What may have given rise to this opinion it is not easy to discover. Perhaps the swarthy complexion of both people may have led them to this sentiment. Eusebius indeed informs us *, that "a numerous colony of people emigrated from the banks of the Indus, and, crossing the ocean, fixed their residence in the country now called Ethiopia." For our part, we are rather inclined to believe, that the original Ethiopians transported themselves into India, and there perhaps co-operated with the Egyptians in digging the excavations and framing the statues, some of which are still to be seen in that country, and which we have mentioned in another Section. The Greeks called those people *Αιθιοπες, Æthiopes*, we believe, from their sun-burnt countenance; but indeed they were very little acquainted either with the country or its inhabitants.

* *Chron.* p. 12.

67 Ancient language of Egypt a sister dialect of Hebrew.

The most ancient name of Egypt was *Mizraim*, of consequence the Arabians still call it *Mesri*. It was likewise distinguished by other names, such as *Oceana*, *Aeria*, &c. It appears from the sacred historian, that it was inhabited by the descendants of Mizraim the second son of Ham. Mizraim had several sons, who, according to the Scripture account, settled respectively in that country. If we trust to the sacred records, there will be little difficulty in ascertaining the language of the Mizraim. It will appear to be one of the sister dialects of the Hebrew, Phœnician, Arabic, Chaldaic, &c.; and this, to us, appears to be the fact. But the origin of that people, their language, religion, laws, and institutions, have been so warped and confounded, both by their own historians and those of other countries, that one is scarce able to determine what to believe or what to

(E) Where the capital of Ethiopia was situated.

(F) A very learned German, who published a grammar and dictionary of the Geez in folio.

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to reject. Herodotus, Diodorus Siculus, Strabo, Ptolemy, and most other ancient geographers and historians, are universally agreed, that Egypt, at least that part of it called *Delta*, was overflown by the sea, and consequently uninhabitable for many centuries after the dispersion of mankind. When we consider the low situation of the Delta, and the violent current of the tide from the coast of Phœnicia and Palestine towards that shore, we would be almost tempted to adopt this hypothesis; but the sacred records avouch the contrary. According to them, we find Egypt a populous, rich, and flourishing kingdom, as early as the age of Abraham. Had the Lower Egypt been a pool of stagnating water at any time after the general deluge, we think it could not have been drained, cleared, cultivated, and stocked with inhabitants, so early as the days of Abraham.

Diodorus Siculus, however, is positive that the Egyptians * were a colony of Ethiopians; and this he endeavours to prove by the similarity of features, customs, laws, religious ceremonies, &c. between the two nations. That there was a constant intercourse of good offices between these two branches of the Hamites, cannot be questioned; and that they nearly resembled each other in many respects, is too evident to admit of contradiction. The excavations, originally dug out of the solid rocks of porphyry and marble, in which the natives resided before the plains were drained, have been observed by a most judicious traveller (G) a very few years ago. At the same time, the most accurate and judicious travellers (H) who have visited that region in modern times, are generally of opinion that the land has gained nothing on the sea since the period when Herodotus wrote his description of that country; from which circumstances we may be led to conclude, that the idea of the inundation of the Delta is not founded in fact.

* Lib. xiii. *passim.*

But even admitting that the Egyptian Delta has acquired nothing from the sea since the age of Herodotus to the present, it certainly does not follow that the region in question was never overflown by that element; since there are in many parts of the globe, large tracts of land, certainly once covered with sea, which have continued to this day in the very same situation in which they were 2000 years ago. We leave the decision of this point to the judgment of our readers.

We have already hinted our opinion of the nature of the Egyptian language; but because Egypt is generally thought to have been the native land of hieroglyphics, and because many are of opinion that hieroglyphical characters were prior to alphabetical, we shall hazard a few conjectures with respect to that species of writing.

68 Egyptian hieroglyphics.

The end of speech, in general, is to enable men to communicate their thoughts and conceptions one to another when present; the use of writing is to perform the same office when people are at so great a distance that vocal sounds cannot mutually reach them. Hieroglyphics are said to have been invented to supply this defect. The most ancient languages were everywhere full of tropes and figures borrowed from sensible objects. As in that stage of society men have not learned to abstract and generalize, all their ideas are borrowed from such objects as most forcibly strike their senses. This circumstance would naturally suggest to savages the idea of conveying their sentiments to each other, when absent, by delineations of corporeal objects. Thus, if a savage asked a loan of his friend's horse, he might find means to have conveyed to him the figure of that animal; and so of others. This was the very lowest species of ideal communication, and has been styled *picture-writing*.

Necessity would soon impel our savage correspondents to fabricate a method more extensively useful, which would likewise be suggested by the constant use of the metaphorical mode of speech. Some savage leader, more sagacious than the vulgar herd, would observe that certain sensible objects were fitted, according to the rules of analogy, to represent certain human passions, and even some abstract ideas; and this would be readily enough adopted by the herd as a new improvement. In this case a *horn* might be the emblem of *power*, a *sword* of *bravery*, a *lion* of *fury*, a *fox* of *cunning*, a *serpent* of *malice*, &c. By and by artificial signs might be contrived to express such ideas as could not readily be denoted by bodily objects. This might be called *symbolical writing*. Such was the foundation of the Chinese characters; and hence that prodigious number of letters of which the written language of that people is composed. Farther they could not proceed, notwithstanding their boasted inventive powers; and farther, we believe, no nation ever did proceed, who had once upon a time no other characters but hieroglyphical. The Mexicans had arrived at the very lowest stage of hieroglyphical writing, but had not taken one step towards alphabetical. The Hurons employ hieroglyphical symbols, but never entertained a single idea of alphabetical. Hieroglyphical characters are the images of objects conveyed to the mind by the organs of vision; alphabetic are arbitrary artificial marks of sound, accommodated by compact to convey to the mind the ideas of objects by the organs of hearing. In a word, we think that there is not the least analogy between these two species to conduct from the one to the other: we are therefore of opinion, that hieroglyphical characters were never the vulgar channels of ideal conveyance among civilized people.

69 Were never in vulgar use;

We know that in this point we differ from many learned, judicious, and ingenious writers; some of whom have taken much pains to investigate the intermediate stages through which the fabricators of characters must have passed in their progress from hieroglyphical to alphabetical writing. These writers have adopted a plan analogous to Bishop Wilkins's project of an artificial language. In this theory, we own, we are led to suspect that they supposed all mankind were once upon a time *savages*, and were left to hammer out words, as well as characters, by necessity, ingenuity, experience, practice, &c. For our part, we have endeavoured to prove, in our section on the Hebrew language, that alphabetical writing was an antediluvian invention; and we now lay it down as our opinion, that among all those nations which settled near the centre of civilization,

(G) See Mr Bruce's Travels, vol. i.

(H) Mr Bruce, Dr Shaw, Bishop Pococke, Savary, Volney, &c.

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tion, hieroglyphics were, comparatively, a modern fabrication.

The Orientals are, at this day, extravagantly devoted to allegory and fiction. Plain unadorned truth with them has no charms. Hence that extravagant medley of fables and romance with which all antiquity is replete, and by which all ancient history is disguised and corrupted. Every doctrine of religion, every precept of morality, was tendered to mankind in parables and proverbs. Hence, says the Scripture, to understand a proverb, the words of the wise, and their dark sayings. The eastern sages involved their maxims in this enigmatical dress for several reasons: to fix the attention of their disciples; to assist their memory; to gratify their allegorical taste; to sharpen their wit and exercise their judgment; and sometimes perhaps to display their own acuteness, ingenuity, and invention.

It was among the ancients an universal opinion, that the most sacred arcana of religion, morality, and the sublime sciences, were not to be communicated to *the uninitiated rabble*. For this reason every thing sacred was involved in allegorical darkness.

Here, then, we ought to look for the origin of
70 hieroglyphical or picture writing among the civilized nations of the east. They did not employ that species of writing because they were ignorant of alphabetical characters, but because they thought fit to conceal the most important heads of their doctrines under hieroglyphical figures. The Egyptian priests were most celebrated for their skill in devising those emblematical representations; but other nations likewise employed them. We learn from the fragments of Berosus the Chaldean historian, preserved by Syncellus and Alexander Polyhistor, that the walls of the temple of Belus at Babylon were covered all over with those emblematical paintings. These characters were called ἱεροι, because they were chiefly employed to represent sacred objects; and γλυφικα, because they were originally carved or engraved. Their name points to their original use. Instead of pursuing these observations, which the nature of our design will not permit, we must refer our readers to Herodotus, lib. ii. Diodorus Sic. lib. i. Strabo, lib. xvii. Plut. Isis et Osiris; and among the Christian fathers, to Clem. Alex. Euseb. Præp. Evang.; but chiefly to Horapollo's Hieroglyphica.

but employed to conceal sacred doctrines from the uninitiated;

From this deduction we would conclude, that this species of writing was an adventitious mode in Egypt, peculiar to the priests, and employed chiefly to exhibit things sacred; and that among all civilized people it did not supersede the use of alphabetical characters,
71 nor did the use of the latter originate from the former. When alphabetical letters were invented, if indeed they were a human invention, they were antecedent to the other in use and extent. The Egyptian priests alone knew the true import of those sacred symbols; and communicated that knowledge first to their own children from generation to generation, then to the initiated, and last of all to the grandees of the nation, all of whom were indeed initiated. The hieroglyphics of Egypt were not then the symbols of any sacred occult language; but signs invented by the priests and prophets or wise men, in order to represent their deities, the attributes and perfections of their deities, and the mysterious arcana of their religion, and many other circumstances relating to objects of importance, which were deemed either too sacred or too important to be imparted to the vulgar.

and posterior in time to alphabetical characters.

The Egyptians ascribed the invention of letters to a person whom they called *Thoth* *, *Theuth*, or *Thyoth*; the Greeks Ἑρμης; and the Romans *Mercurius*. Plato † calls him a god, or a godlike man; Diodorus ‡ makes him privy counsellor to Osiris; Sanchoniathon ap. Euseb. § connects him with the Phœnician Cronus or Saturn. To this Mercury the Egyptians ascribe the invention of all the arts and sciences. He was probably some very eminent inventive genius, who flourished during the first ages of the Egyptian monarchy, and who perhaps taught the rude savages the art of writing.

* *Euseb. Prep. Ev.*
† *Phædrus.*
‡ Lib. i.
§ *Prep. Ev.*

72
According to Diodorus Siculus, the Egyptians had two kinds of letters *; the one sacred, the other common: the former the priests taught their own children, the latter all learned promiscuously. In the sacred characters the rites and ceremonies of their religion were couched; the other was accommodated to the ordinary business of life. Clem. Alexand. mentions three different styles of writing employed by the Egyptians †. "The pupils, who were instructed by the Egyptians, first learned the order and arrangement of the Egyptian letters, which is called *epistolography*, that is, the manner of writing letters; next, the sacred character, which the sacred scribes employed; lastly, the hieroglyphic character, one part of which is expressed by the first elements, and is called *Cyriologic*, that is, *capital*, and the other *symbolic*. Of the symbolic kind, one part explains properly by imitation; and the other is written tropically, that is, in tropes and figures; and a third by certain enigmatical expressions. Accordingly, when we intend to write the word *sun*, we describe a circle; and when the moon, the figure of that planet appearing horned, conformable to the appearance of that luminary after the change." In this passage we have an excellent description of the three different modes of writing used by the Egyptians; the common, the sacred, and the hieroglyphic. The last he describes according to its three divisions, in exact conformity to our preceding observations.

Two kinds of alphabetical characters in Egypt.
* Lib. i.
† *Strom.* lib. v.

73
By the description above translated, it plainly appears, that the sacred character of the Egyptians was entirely different from the hieroglyphic; and by this consideration we are in a good measure justified, in supposing, as we have done all along, that the sacred letters of the Egyptians were actually the Chaldaic. The inscriptions on the obelisks mentioned by Cassiodorus, so often quoted, were certainly engraved in the sacred character; and the character in which they were drawn was that above mentioned. If the sacred letters were Chaldaic, the sacred language was probably the same.

The sacred letters and language of Egypt Chaldaic.

The Egyptians pretended, that the Babylonians derived the knowledge of the arts and sciences from them; while, on the other hand, the Babylonians maintained, that the former had been tutored by them. The fact is, they both spoke the same language; used the same religious rites; had applied with equal success to astrology, astronomy, geometry, arithmetic, and the other

sciences;

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ſciences; of courſe a rivalſhip had ariſen between the two nations, which laid the foundation of thoſe oppoſite pretenſions.

The moſt faithful ſpecimen of the vulgar language of the Egyptians, is, we believe, ſtill preſerved in the Coptic, which, however, is ſo replete with Greciſms, that it muſt be difficult to trace it out.

Under the Ptolemies, the Greek was the language of the court, and conſequently muſt have diffuſed itſelf over all the country. Hence, we believe, two-thirds of the Coptic are Greek words, diverſified by their terminations, declenſions, and conjugations only. To be convinced of the truth of this, our learned and curious readers need only conſult Chriſtian Scholtz's Egyptian and Coptic grammar and dictionary, corrected and publiſhed by Godfred Woide, Oxford, 1788.

74 The Egyptian and Phœnician languages the ſame.

The Egyptians and Phœnicians were in a manner couſin-germans, and conſequently muſt have ſpoken the ſame language; that is, one of the ſiſter dialects of the Hebrew, Chaldean, Arabian, Cuſhite, &c.—This is not a mere conjecture; it may be realized by almoſt numberleſs examples. It is true, that when Joſeph's brethren went down to Egypt, and that ruler deigned to converſe with them, they could not underſtand the Egyptian idiom which he ſpoke; nor would he, had he been actually an Egyptian, have underſtood them without an interpreter. The only concluſion from this circumſtance is, that by this time the Egyptian had deviated conſiderably from the original language of mankind. The Iriſh and Welch, every body knows, are only different dialects of the Celtic tongue; and yet experience proves, that a native of Ireland and another of Wales cannot well comprehend each other's language, nor converſe intelligibly without an interpreter. The Erſe, ſpoken in the Highlands of Scotland, and the Iriſh, are known to be both branches of the old Celtic; yet a Scotch Highlander and an Iriſhman can hardly underſtand each other's ſpeech. By a parity of reaſon, a Hebrew and an Egyptian might, in the age of Joſeph, ſpeak only different dialects of the ſame original tongue, and yet find it difficult to underſtand one another. The fact ſeems to be, the Hebrew dialect had been in a manner ſtationary, from the migration of Abraham to that period; whereas the Egyptian, being ſpoken by a powerful, civilized, and highly cultivated people, muſt have received many improvements, perhaps additions, in the courſe of near two centuries.

75 The vulgar letters of Egypt nearly the ſame with the Hebrew or Phœnician.

The deſcendants of Canaan and of Mizraim were ſtrictly connected in their religious ceremonies: they worſhipped the ſame objects, namely, the *Hoſt of Heaven*; they mourned *Oſiris* and *Adonis* in concert; they carried on a joint commerce, and, we think, ſpoke the ſame language: we may, therefore conclude, that their vulgar letters were nearly the ſame, both in form, diſpoſition, and number. Their original number was probably 16, viz. five vowels, ſix mutes, ſimple and middle, four liquids, and the ſolitary σ.—With theſe, it is likely, was joined a mark of aſpiration, or an *h*, ſuch as we have in the Roman alphabet, and find on ſome Greek monuments. Cadmus was originally an Egyptian; that leader brought a new ſet of letters into Greece. Theſe are generally deemed to be Phœnician. They were nearly the ſame with the ancient Pelaſgic, as will be ſhown in the ſection of the *Greek language*. The latter, we think, were from Egypt, and conſequently the former muſt have been from the ſame quarter. Danaus, Perſeus, Lelex, &c. were of Egyptian extraction: they too adopted the Cadmean characters, without ſubſtituting any of their own.

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The Jonim, or Ionians, emigrated from Gaza, a colony of Egyptians; and their letters are known to have differed very little from thoſe of Cadmus and the Pelaſgi. The concluſion, therefore, is, that the vulgar Egyptian letters were the ſame with the Phœnician.

We are abundantly ſenſible that there are found upon Egyptian monuments characters altogether different from thoſe we have been deſcribing. At what time, by what people, and to what language, theſe letters belonged, we will not pretend to determine. The Ethiopians, the Chaldeans, the Perſians, the Greeks, the Romans, the Saracens, have, at different times, been ſovereigns of that unhappy country. Perhaps other nations, whoſe memory is now buried in oblivion, may have erected monuments, and covered them with inſcriptions compoſed of words taken from different languages, perhaps, upon ſome occaſions, whimſically deviſed, with a view to perplex the curious antiquaries of future ages. Some of theſe are compoſed of hieroglyphics intermingled with alphabetical characters, artificially deranged, in order to render them unintelligible. Theſe we do not pretend to develope; becauſe the moſt inquiſitive and ſagacious antiquaries are not yet agreed as to their purport and ſignification.

76 Egyptian names of Hebrew original.

We ſhall now go on to ſhow, that moſt part of the names of perſons and places, &c. which have been conveyed down to us, may, in general, be reduced to a Hebrew, Phœnician, Syrian, or Chaldean original. As the firſt of theſe languages is moſt generally known, we ſhall employ it as our arch-type or ſtandard, beginning with thoſe terms which occur in Scripture.

The word *Pharaoh*, the title of the *melech* or king of Egypt, is, we think, compounded of two terms, which plainly diſcover a Hebrew original. According to an oriental tradition, the firſt who aſſumed this title was the ſovereign of the *royal ſhepherds*; a race of people from Arabia and Phœnicia. They conquered Egypt at an early period, and kept poſſeſſion of it for ſeveral centuries. They gloried in the title ὑκσοι, or ὑκουσοι, which according to Joſephus *contra Apion.* ſignifies "royal ſhepherds." The word *Pharaoh* ſeems to be compounded of פר *Phar*, "a bullock," and רעה, *Rachah*, "to feed;" hence פרעה, *Pharachah*, as we think it ought to be written. The name given to Joſeph is evidently of kin with the Hebrew; for *zaphnath* differs very little from the Hebrew verb *tzaphan*, which ſignifies "to hide, to keep ſecret;" *Paneah* or *Phaneah*, ſignifies much the ſame with the Hebrew *Phanah*, aſpexit: ſo that the name actually intimates *one* who ſees hidden things; which was certainly the very idea the prince intended to convey by giving him that name.

Potiphar, or *Potipherah*, the name of Joſeph's father-in-law, has likewiſe a dialectical affinity with the Hebrew idiom. In that language *Patah* ſignifies "to open, to explain," which was one part of the ſacerdotal office; and *Phar* imports "a bullock." Potiphar was then

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then prieſt of the bullock, that is, the ox, *apis*, ſacred to the *ſun* (I). This perſon was prieſt or *prince of On*, which, according to Cyrillus on Hoſea, was an Egyptian name of that luminary. The Hebrew word *hon* or *chon* ſignifies "power, wealth, ſufficiency;" a very proper epithet for the *ſun*, who was thought to beſtow thoſe bleſſings. The name of Joſeph's wife was *Aſenath* or *Aſnath*, compounded of *Iſhah*, "a woman," and *Naith* or *Neit*, an Egyptian name of Minerva, "a votary of Minerva."

Almoſt all the names of cities belonging to Egypt which are mentioned in Scripture are evidently Hebrew. To be ſatisfied as to this poſition, our curious readers may conſult Jamieſon's *Spicilegia*, an excellent book very little known.

77 and ſignificant in that language.

The names of moſt of the Egyptian deities are ſignificant in the Hebrew tongue; and in that dialect the names appear to have been impoſed with great judgment and propriety, plainly indicating ſome office aſſigned them, or pointing to ſome peculiar attribute. We ſhall produce a few inſtances.

Oſiris was the great divinity of Egypt; he was certainly the *ſun*. The Egyptians gave their deities a variety of names in alluſion to their various offices and attributes. Jablonſki has in a manner wearied himſelf with tracing the ſignification of this name. In Hebrew we have *Oſhir*, "to grow rich, to be enriched." The ſun may be called the great enricher of nature, and therefore might properly be called by a name alluding to that quality. *Iſis* was both the moon and the earth. *Iſhah* is the Hebrew word for *woman*, and Horapollo aſſigns this very derivation. *Anubis* was one of the names of Mercury among the Egyptians: He was always figured with the head of a *dog*. He accompanied *Iſis* in her peregrinations in queſt of Oſiris, and frighted away the wild beaſts from attacking the princeſs. In Hebrew, *Nubah* ſignifies "to bark." Here the analogy, we think, is evident. Many Egyptian names begin with *Can*, ſuch as *Canobus*, *Canopus*, &c. The Hebrew word *Cahen* or *Cohen*, Syr. *Con* or *Chon*, intimates both a prince and a prieſt. *Ob* or *Aub*, in Hebrew, imports "a bottle, a flaggon," any thing round and prominent like the human belly. In the language of Egypt it was often applied to the ſun, in alluſion to his rotundity. In the temple of *Jupiter Ammon* or *Amon*, in the deſert of Libya, there was a ſtatue of the god repreſenting the *navel* of the human body, which was probably framed in alluſion to this fancy. Hence the Pythoneſs, or people who, according to the Scripture, had familiar ſpirits, were ſaid to propheſy by the inſpiration of *Ob*, as the Delphic prieſteſs did by that of Apollo. Again, many Egyptian names end with *ſiris*, as Caloſiris, Termoſiris. This termination is no doubt a cognate of the Hebrew and Chaldean *ſar* or *zar*, ſignifying "a prince, or grandee, &c." The river Nile in the Ethiopic dialect is called *Siris*; that is, we believe, the *king of rivers*. The ſame flood ſeems to derive the name by which it is generally known, from the Hebrew *nahel*, "a valley, or torrent running down a valley." The ſame river was often called *Oceanus*, a word compoſed of *og*, or *oc*, or *och*, which ſignifies "a king, a leader," and the Hebrew *ain*, "a fountain;" ſo that the word imports the *king of fountains*. The Hebrews always denominated the land of Egypt the land of Mizraim; the Egyptians themſelves, in later times, ſeemed to have called it Αιγυπτος, *Ægyptus*, "Egypt," which ſome think is compounded of *Ai*, Hebrew, "an iſland, a country, a province," and *Copt* or *Cupt*, "a famous city in that country."

From this ſpecimen, we hope it will appear that the Egyptian language in the more early ages was one of thoſe dialects into which that of the deſcendants of the poſtdiluvian patriarchs was divided, and perhaps ſubdivided, a few centuries after the deluge. Among all thoſe, we believe, ſuch an affinity will be found, as plainly demonſtrates that they originally ſprung from one common ſtock. Here we might eaſily follow the Egyptian language into Greece; and there we are perſuaded we might trace a vaſt number of Egyptian terms into that tongue, which, however, the nature of this inquiry will not permit. If our learned readers ſhould incline to know more of the affinity of the Egyptian tongue with the others ſo often mentioned, they may conſult Bochart's *Chanaan*, Walton's *Proleg.* Gebelin's *Monde Prim.* Jamieſon's *Spicilegia*, &c.

Sect. IV. *Of the Perſian Language.*

The Perſian language is divided into the ancient and modern; the former of which is at this day very imperfectly known, the latter is at preſent one of the moſt expreſſive, and at the ſame time one of the moſt highly poliſhed, in the world. We ſhall, in treating of this language, in compliance with the plan we have all along followed, begin with the ancient.

78 At the birth of Mohammed two languages prevalent in Perſia.

When Mohammed was born, and Anu'shi'rava'n, whom he calls the *juſt king*, ſat on the throne of Perſia, two languages were generally prevalent in that empire (K). The one was called *Deri*, and was the dialect of the court, being only a refined and elegant branch of the *Parſi*, ſo called from the province of which *Shiraz* is now the capital; and that of the learned, in which moſt books were compoſed, and which had the name of *Pahlavi*, either from the heroes who ſpoke it in former times, or from *pahlu*, a tract of land which included ſome conſiderable cities of *Iran*: The ruder dialects of both were ſpoken by the ruſtics of ſeveral provinces; and many of theſe diſtinct idioms were vernacular, as happens in every kingdom of conſiderable extent.

79 And a more ancient language than either known only to the prieſts.

Beſides the *Parſi* and *Pahlavi*, a very ancient and abſtruſe tongue was known to the prieſts and philoſophers, called the language of the *Zend*, becauſe a book on religious and moral duties which they held ſacred, and which bore that name, had been written in it; while the *Pazend* or comment on that work was compoſed in *Pahlavi*, as a more popular dialect. The letters of this book were called *zend*, and the language *aveſta*.

The *Zend* and the old *Pahlavi* are now almoſt extinct in *Iran*, and very few even of the Guebres can read it; while the *Parſi* remaining almoſt pure in *Shahnameh*, has

(I) The Septuagint (Gen. xli. v. 45. and 50.) tranſlate *On* by Ἡλιούπολις.

(K) The moderns call the empire of Perſia *Iran*; a name unknown to the ancients.

Persian Language. has, by the intermixture of Arabic words, and many imperceptible changes, now become a new language, exquisitely polished by a series of fine writers both in prose and verse, analogous to the different idioms gradually formed in Europe after the subversion of the Roman empire.

80 Parsi language, and The very learned and laborious Sir William Jones is confident that the *Parsi* abounds with words from the Sanscrit, with no other change than such as may be observed in the numerous dialects of India; that very many Persian imperatives are the roots of Sanscrit verbs; and that even the moods and tenses of the Persian verb substantive, which is the model of all the rest, are deducible from the Sanscrit by an easy and clear analogy. From this he infers that the *Parsi*, like the various idiom dialects, is derived from the language of the Bramins. This conclusion, we imagine, is not altogether just, since by the same train of reasoning we may infer that the Sanscrit is derived from the *Parsi*.

The same learned gentleman adds, that the multitude of compounds in the Persian language proves that it is not of Arabic but Indian original. This is undoubtedly true; but though the *Parsi* is not of Arabic original, it does not necessarily follow that it is of Sanscrit. We might with the same propriety, and with an equal show of reason, conclude, that the Greek language is descended of the Sanscrit, because it too abounds with compounds. We may then rest assured, that neither the one nor the other argument adduced by the ingenious president proves that the *Parsi* tongue is a descendant of the Sanscrit.

The gentleman so often mentioned, assures us, that the Zend bears a strong resemblance to the Sanscrit; which, however, it might do without being actually derived from it, since we believe every oriental scholar will find that all the languages from the Mediterranean to the utmost coast of Hindostan exhibit very strong signatures of a common original. The Parsi, however, not being the original dialect of Iran or Persia, we shall pursue it no farther at present, but return to give some account of the Pahlavi, which was probably the primitive

81 the Pahlavi, language of the country. We have observed above, that the Pazend or comment on the Zend was composed in the Pahlavi for the use of the vulgar. This, according to Sir William, was a dialect of the Chaldaic; and of this assertion he exhibits the following proof.

By the nature of the Chaldean tongue, most words ended in the first long vowel, like *shemaiá*, "heaven;" and that very word, unaltered in a single letter, we find in the Pàzend, together with *lailiá*, "night," *meyá*, "water," *nirá*, "fire," *matrá*, "rain," and a multitude of others, all Arabic or Hebrew, with a Chaldean termination; so *zamar*, by a beautiful metaphor from *pruning trees*, means in Hebrew to *compose verses*, and thence, by an easy transition, to *sing* them; now in Pahlavi we see the verb *zamarúniten*, "to sing," with its forms *zamarraunemi*, "I sing," and *zamrunid*, "he sang;" the verbal terminations of the Persian being added to the Chaldaic root. All these words are integral parts of the language; not adventitious like the Arabic nouns and verbals engrafted on the modern Persian.

From this reasoning it plainly appears, 1st, That Pahlavi was the ancient language of Persia; and, 2d, That the ancient Persian was a cognate dialect of the Chaldean, Hebrew, Arabic, Phoenician, &c. M. Anquetil has annexed to his translation of the *Zendavesta* two vocabularies in Zend and Pahlavi, which he found in an approved collection of *Rawayat* or *Traditional Pieces* in modern Persian. His vocabulary of the Pahlavi strongly confirms this opinion concerning the Chaldaic origin of that language. But with respect to the Zend, it abounded with vast numbers of pure Sanscrit words, to such a degree, that six or seven words in ten belonged to that language.

82 derived from Chaldaic and Sanscrit, &c. From this deduction it would appear, that the oldest languages of Persia were Chaldaic and Sanscrit; and that when they had ceased to be vernacular, the Pahlavi and Zend were deduced from them respectively, and the Parsi either from the Zend, or immediately from the dialect of the Brahmans: but all had perhaps a mixture of Tartarian; for the best lexicographers assert, that numberless words in ancient Persian are taken from the Cimmerians. With respect to the last of these, we cannot help being of opinion, that colonies of people from the neighbourhood of Persia did transport themselves into Crim Tartary, and perhaps into Europe. These colonists brought along with them those vocables which still occur in their dialect. Emigrants from those quarters must have found their way into Scandinavia, since numberless Persian words are still current in those regions. Perhaps Odin and his followers emigrated from the neighbourhood of Media and Persia, and brought with them the dialect of the nations from whose country they had taken their departure.

83 The Zend from the same source. With respect to the Zend, it might well be a dialect of the Sanscrit, and was probably a sacred language; and if so, concealed from the vulgar, and reserved for the offices of religion. If Zoroastres, or Zaratusht as the orientals call him, travelled into Egypt, and was initiated in the mysteries of the Egyptian religion, as some pretend he was, he might be instructed in the sacred dialect of that people by the priests under whom he studied. When that philosopher returned into Persia, and became the apostle of a new religion, he might compose the volume of his laws and religious institutions in the sacred language of his Egyptian tutors. This language then became that of the Magi, who concealed it carefully from the knowledge of the uninitiated, as the priests did in Egypt and the Brahmans in Hindostan.

In our Section on the *Sanscrit* language, we shall give a detail of a number of particulars, which to us seem to furnish a presumption that the language in question was imported from Egypt into Hindostan. We confess there are not sufficient data to improve these presumptions into absolute certainty; but we hope the time is at hand when the worthy members of the Asiatic Society will discover abundant materials to ascertain the truth of this position. We are the rather inclined to adopt this hypothesis, when we consider the character of Zoroastres in connection with that of the Egyptian Cohens and of the Indian Brahmans.

If this opinion should one day appear to be well-founded, we believe the coincidence between the language of the Zend and the Sanscrit will be easily accounted for, without making the Hindoos masters of Iran or Persia, and then driving them back to the shores of the Ganges. That the nations of Turan or Scythia did

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did actually overrun that country, and make themſelves maſters of a conſiderable part of it at different times, is vouched by the records and traditions of the Perſians themſelves. Upon thoſe occaſions a number of Tartarian words might be introduced into the country, and acquire a currency among the inhabitants. As the annals of ancient Perſia have been long ſince deſtroyed and conſigned to eternal oblivion, it is impoſſible to aſcertain either the extent or duration of theſe irruptions. Indeed the nature of our deſign does not call for that inveſtigation.

84
Proofs from Scripture of the origin of the Pahlavi.

In order to corroborate the cognation between the Chaldean and Pahlavi languages, we ſhall ſubjoin a few arguments derived from the Moſaic hiſtory, and the other writings of the Old Teſtament. Theſe we believe will be admitted as irrefragable proofs of the poſition above advanced by ſuch as admit the authenticity of thoſe records.

Elam is always allowed to have been the progenitor of the Perſians. This patriarch was the eldeſt ſon of Shem the ſon of Noah; and according to the Moſaic account, his poſterity ſettled in the neighbourhood of the deſcendants of Aſhur, Arphaxad, Lud, and Aram, the other ſons of Shem. The country where they ſettled was denominated *Elymais* *, as late as the beginning of the Chriſtian era. This name was retained till the Saracens conquered and took poſſeſſion of that country. If this was the caſe, as it certainly was, the Elamites or Perſians ſpoke a dialect of the primary language, which, in the firſt Section, we have proved to have been the Hebrew.

* *Strabo*, lib. 11.

When the four eaſtern monarchs invaded the five cities of the plain in Canaan †, Chedorlaomer king of Elam was at the head of the confederacy. Amraphel king of Shinar, that is Babylon or Chaldea, was one of the allies; Arioch king of Elaſar was another; and Tidal, king of ſome ſcattered nations in the ſame neighbourhood, was the fourth. That Chedorlaomer was principal in this expedition, is obvious from the hiſtorian's detail of the ſecond, where that prince is placed firſt, and the reſt are named *the kings that were with him*. This paſſage likewiſe demonſtrates, that Elam, Shinar, and Elaſar, lay contiguous, and were engaged in the ſame cauſe. Wherever the country in queſtion is mentioned in Scripture prior to the era of Daniel and Ezra, it is always under the name of *Elam*. To go about to prove this would be ſuperfluous.

† Gen. chap. xiv.

According to Xenophon ‡, the Perſians knew nothing of horſemanſhip before the age of Cyrus: but that hiſtorian informs us, that after that monarch had introduced the practice of fighting on horſeback, they became ſo fond of it, that no man of rank would deign to fight on foot. Here it ought to be conſidered, that the hiſtorian above mentioned was now writing a moral, military, and political romance; and therefore introduces this anecdote, in order to exalt the character of his hero: ſo that we are not to ſuppoſe that the people under conſideration were unacquainted with the art of horſemanſhip till that period.

‡ *Cyrop.* lib. 1.

The very name *Phars* or *Pharas* is certainly of Hebrew origin, and alludes to the ſkill that people profeſſed in horſemanſhip. The original ſeems to be *Pharſah*, *ungula*, "a hoof;" and in the Arabic *Pharas* intimates a *horſe*, and *Pharis* a *horſeman*. Conſequently the people were denominated *Parſai*, and the country *Pars*, becauſe they were trained from their infancy to ride the *great horſe*, which indeed they deemed their greateſt honour. This name was perhaps firſt impoſed upon them by the neighbouring nations, and in proceſs of time became their gentile appellation. *Mithras* is generally known to have been the chief divinity of the Perſians; a name which is plainly derived from *Mither*, "great." We find in Strabo the Perſian god *Amanus*, which is plainly a cognate of *Hamah*, the "ſun or fire." Hence we believe comes *Hamanim*, the "hearths or chapels," where the fire ſacred to the ſun was kept burning; which, we believe, the Greeks called Πυραθεια, or "fire-temples." Herodotus * mentions a cuſtom among the Perſians, according to which, when they came to engage an enemy, they caſt a rope with a kind of gin at the end of it on their enemy, and by theſe means endeavoured to entangle and draw him into their power. The people of Perſia who employed this net or gin were called *Sargatæ*, from *ſaragſ*, *ſharag*, or *ſerig*, a word which in Hebrew, Arabic, and Chaldaic, ſignifies to "hamper or entangle:" hence perhaps the Greek word Σαργανη, a "baſket or net." *Sar* or *zar* in Hebrew, Phœnician, Syriac, &c. ſignifies "a lord, a prince;" and hence we have the initial ſyllable of the far-famed *zar-tuſht*, *Zoroaſtres*. In a word, moſt of the Perſian names that occur in the Grecian hiſtories, notwithſtanding the ſcandalous manner in which they have been diſguiſed and metamorphoſed by the Greeks, may ſtill with a little ſkill and induſtry be traced back to a Hebrew, Chaldaic, Syriac, or Phœnician origin. In the books of Daniel, Ezra, Nehemiah, and Eſther, we find a number of Perſian names which are all of a Hebrew or Chaldaic complexion: to inveſtigate theſe at much greater length would be foreign to the deſign of the preſent article. If our curious reader ſhould incline to be more fully ſatisfied as to this point, he may conſult Bochart's *Chanaan*, D'Herbelot's *Bib. Orient.* Walton's *Proleg.* &c.

* Lib. ix. cap. 85.

It now appears, we hope, to the entire ſatisfaction of our readers, that the Pahlavi is a remnant of the old Perſian, and that the latter is a cognate branch of the Hebrew, Chaldaic, Syriac, &c. We have likewiſe adduced ſome preſumptive proofs that the Zend was copied from the ſacred language of the Egyptians: we ſhall now endeavour to explain by what changes and revolutions the language firſt mentioned arrived at its preſent ſummit of beauty and perfection.

85
Progreſs of the Perſian language.

We have obſerved above, that the Scythians, whom the old Perſians called Σακαι, *Sacæ*, and whom the modern call *Turan*, often invaded and overran Perſia at a very early period. The conſequence was, an infuſion of Scythian or Tartarian terms, with which that language was early impregnated. This in all probability occaſioned the firſt deviation from the original ſtandard. The conqueſts of Alexander, and the dominion of his ſucceſſors, muſt, one would imagine, introduce an inundation of Greek words. That event, however, ſeems to have affected the language in no conſiderable degree, at leaſt very few Grecian terms occur in the modern Perſian.

The empire of the *Arſacidæ* or Parthians, we apprehend, produced a very important alteration upon the ancient Perſian. They were a demi-Scythian tribe; and as they conquered the Perſians, retained the dominion of thoſe parts for ſeveral centuries, and actually incorpo-

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rated with the natives, their language muſt neceſſarily have given a deep tincture to the original dialect of the Perſians. Sir William Jones has obſerved, that the letters of the inſcriptions at *Iſtakhr* or Perſepolis bear ſome reſemblance to the old Runic letters of the Scandinavians. Thoſe inſcriptions we take to have been Parthian; and we hope, as the Parthians were a Tartarian clan, this conjecture may be admitted till another more plauſible is diſcovered. The Perſians, it is true, did once more recover the empire; and under them began the reign of the Deri and Parſi tongues: the former conſiſting of the old Perſian and Parthian highly poliſhed; the latter of the ſame languages in their uncultivated vernacular dreſs. In this ſituation the Perſian language remained till the invaſion of the Saracens in 636; when theſe barbarians overran and ſettled in that fine country; demoliſhed every monument of antiquity, records, temples, palaces, every remain of ancient ſuperſtition; maſſacred or expelled the miniſters of the Magian idolatry; and introduced a language, though not entirely new, yet widely differing from the old exemplar.

But before we proceed to give ſome brief account of the modern Perſian, we muſt take the liberty to hazard one conjecture, which perhaps our adepts in modern Perſian may not find themſelves diſpoſed to admit. In modern Perſian we find the ancient Perſian names wonderfully diſtorted and deflected from that form under which they appear in the Scripture, in Cteſias, Megaſthenes, and the other Greek authors. From this it has been inferred, that not only the Greeks, but even the ſacred hiſtorians of the Jews, have changed and metamorphoſed them moſt unmercifully, in order to accommodate them to the ſtandard of their own language. As to the Greeks, we know it was their conſtant practice, but we cannot believe ſo much of the Hebrews. We make no doubt of their writing and pronouncing the names of the Perſian monarchs and governors of that nation nearly in the ſame manner with the native Perſians. It is manifeſt, beyond all poſſibility of contradiction, that they neither altered the Tyrian and Phœnician names of perſons and places when they had occaſion to mention them, nor thoſe of the Egyptians when they occurred in their writings. The Babylonian and Chaldaic names which are mentioned in the Old Teſtament vary nothing from the Chaldean original. No reaſon can be aſſigned why they ſhould have transformed the Perſian names more than the others. On the contrary, in Ezra, Nehemiah, and Eſther, we find the Perſian names faithfully preſerved throughout.

86 Nothing now exiſting in Perſic, except the Zend, older than the Saracen conqueſt.

The fact, we imagine, is this: Our modern admirers of the Perſic have borrowed their names of the ancient kings and heroes of that country from romances and fabulous legends of more modern date and compoſition. The archives of Perſia were deſtroyed by the Saracens: nothing of importance was written in that country till two centuries after the era of Mohammed. What ſucceeded was all fiction and romance. The authors of thoſe entertaining compoſitions either forged names of heroes to anſwer their purpoſe, or laid hold on ſuch as were celebrated in the ballads of their country, or preſerved by vulgar tradition. The names were no doubt very different from thoſe of the ancient kings and heroes of Perſia; and probably many of them had undergone conſiderable changes during the continuance of the Parthian empire. Upon this foundation has the learned Mr Richardſon erected a very irregular fabric, new, and to uſe his own expreſſion, we think built upon *pillars of ice*. He has taken much pains to invalidate the credit of the Grecian hiſtories of the Perſian empire, by drawing up in battle array againſt their records legions of romantic writers, who were not born till near 1000 years after the events had taken place; and to complete the probability, who lived 200 years after all the chronicles of the Medes and Perſians had been finally deſtroyed by the fury of the Saracens.

After the deciſive victory obtained over the Perſians at Kadeſſa, their ancient government was overturned, their religion proſcribed, their laws trampled under foot, and their civil tranſactions diſturbed by the forcible introduction of the lunar for the ſolar kalendar; while, at the ſame time, their language became almoſt overwhelmed by an inundation of Arabic words; which from that period, religion, authority, and faſhion, incorporated with their idiom.

From the ſeventh till the tenth century the Perſian tongue, now impregnated with Arabic words, appears to have laboured under much diſcouragement and neglect. Bagdad, built by Almanſor, became ſoon after the year 762 the chief reſidence of the caliphs, and the general reſort of the learned and the ambitious from every quarter of the empire. At length the acceſſion of the Buyah princes to the Perſian throne marked in the tenth century the great epoch of the revival of Perſian learning. About the year 977 the throne of Perſia was filled by the great Azaduddawla; who firſt aſſumed the title of *Sultan*, afterwards generally adopted by eaſtern princes. He was born in Iſpahan, and had a ſtrong attachment to his native kingdom. His court, whether at Bagdad or in the capital of Perſia, was the ſtandard of taſte and the favourite reſidence of genius. The native dialect of the prince was particularly diſtinguiſhed, and became ſoon the general language of compoſition in almoſt every branch of polite learning. From the end of the tenth till the 15th century may be conſidered as the moſt flouriſhing period of Perſian literature. The epic poet Firdauſi, in his romantic hiſtory of the Perſian kings and heroes, diſplays an imagination and ſmoothneſs of numbers hardly inferior to Homer. The whole fanciful range of Perſian enchantment he has interwoven in his poems, which abound with the nobleſt efforts of genius. This bard has ſtamped a dignity on the monſters and fictions of the eaſt, equal to that which the prince of epic poetry has given to the mythology of ancient Greece. His language may at the ſame time be conſidered as the moſt refined dialect of the ancient Perſian, the Arabic being introduced with a very ſparing hand: whilſt Sadi, Jami, Hafiz, and other ſucceeding writers, in proſe as well as verſe, have blended in their works the Arabic without reſerve; gaining perhaps in the nervous luxuriance of the one language what may ſeem to have been loſt in the ſofter delicacy of the other. Hence Ebn Fekreddin Anju, in the preface to the dictionary called *Farhang Jehanguiri*, ſays, that the Deri and the Arabic idioms were the languages of heaven; God communicating to the angels his milder mandates in the delicate accents of the firſt, while his ſtern commands were delivered in the rapid accents of the laſt.

87 The moſt flouriſhing period of Perſian literature.

For near 300 years the literary fire of the Perſians ſeems

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seems indeed to have been almost extinguished; since, during that time, hardly any thing of that people which deserves attention has appeared in Europe: enough, however, has already been produced, to inspire us with a very high opinion of the genius of the east. In taste, the orientals are undoubtedly inferior to the best writers of modern Europe; but in invention and sublimity, they are excelled, perhaps equalled, by none. The Persians affect a rhetorical luxuriance, which to a European wears the air of unnecessary redundance. If to these leading distinctions we add a peculiar tone of imagery, of metaphor, of allusion, derived from the difference of government, of manners, of temperament, and of such natural objects as characterise Asia from Europe; we shall see, at one view, the great points of variation between the writers of the east and west. Amongst the oriental historians, philosophers, rhetoricians, and poets, many will be found who would do honour to any age or people; whilst their romances, their tales, and their fables, stand upon a ground which Europeans have not yet found powers to reach. We might here quote the Arabian Nights Entertainments, Persian Tales, Pilpay's Fables, &c.

88 The genius of the modern Persic.

We shall now annex a few strictures on the genius of that noble language; though it is our opinion that the province of the philologist is to investigate the origin, progress, and final improvement of a language, without descending to its grammatical minutiæ or peculiar idiomatic distinctions. We have already observed, that the tongue under consideration is partly Arabic and partly Persian, though the latter generally has the ascendant. The former is nervous, impetuous, and masculine; the latter is flowing, soft, and luxuriant. Wherever the Arabic letters do not readily incorporate with the Persian, they are either changed into others or thrown away. Their letters are the Arabic with little variation; these being found more commodious and expeditious than the old letters of the Deri and Parsi. Their alphabet consists of 32 letters, which, like the Arabic, are read from right to left; their form and order will be learned from any grammar of that language. The letters are divided into vowels and consonants as usual. The Arabic characters, like those of the Europeans, are written in a variety of different hands; but the Persians write their poetical works in the Talick, which answers to the most elegant of our Italic hands.

89 Resemblance between Persian and English.

There is a great resemblance between the Persian and English languages in the facility and simplicity of their form and construction: the former, as well as the latter, has no difference of terminations to mark the gender either in substantives or adjectives; all inanimate things are neuter; and animals of different sexes have either different names, or are distinguished by the words *ner*, male, and *made*, female. Sometimes indeed a word is made feminine, after the manner of the Arabians, by having *a* added to it.

The Persian substantives have but one variation of case, which is formed by adding a syllable to the nominative in both numbers; and answers often to the dative, but generally to the accusative, case in other languages. The other cases are expressed for the most part by particles placed before the nominative. The Persians have two numbers, singular and plural; the latter is formed by adding a syllable to the former.

The Persian adjectives admit of no variation but in the degrees of comparison. The comparative is formed by adding *ter*, and the superlative by adding *terin* to the positive.

The Persians have active and neuter verbs like other nations; but many of their verbs have both an active and neuter sense, which can be determined only by the construction. Those verbs have properly but one conjugation, and but three changes of tense: the imperative, the aorist, and the preterite; all the other tenses being formed by the help of particles or of auxiliary verbs. The passive voice is formed by adding the tenses of the substantive verb to the participle of the active.

In the ancient language of Persia there were very few or no irregularities; the imperative, which is often irregular in the modern Persian, was anciently formed from the infinitive, by rejecting the termination *eeden*: for originally all infinitives ended in *den*, till the Arabs introduced their harsh consonants before that syllable, which obliged the Persians, who always affected a sweetness of pronunciation, to change the old termination of some verbs into *ten*, and by degrees the original infinitive grew quite obsolete; yet they still retain the ancient imperative, and the aorists which are formed from it. This little irregularity is the only anomalous part of the Persian language; which nevertheless far surpasses in simplicity all other languages ancient or modern.

With respect to the more minute and intricate parts of this language, as well as its derivations, compositions, constructions, &c. we must remit our readers to Mininskie's *Institutiones Linguæ Turcicæ, cum rudimentis parallelis linguarum Arab. et Pers.*; Sir William Jones's Persian Grammar; Mr Richardson's Arabian and Persian Dictionary; D'Herbelot's *Bibl. Orient.*; Dr Hyde *de Relig. vet. Pers.* &c. Our readers, who would penetrate into the innermost recesses of the Persian history, colonies, antiquities, connections, dialects, may consult the last mentioned author, especially chap. xxxv. *De Persia et Persarum nominibus, et de moderna atque veteri lingua Persica, ejusque dialectis.* In the preceding inquiry we have followed other authors, whose accounts appeared to us more natural, and much less embarrassing.

90 Utility of the Arabian and Persian languages.

To conclude this section, which might easily have been extended into a large volume, we shall only take the liberty to put our readers in mind of the vast utility of the Arabian and Persian languages. Numberless events are preserved in the writings of the orientals which were never heard of in Europe, and must have for ever lain concealed from the knowledge of its inhabitants, had not these two tongues been studied and understood by the natives of this quarter of the globe. Many of those events have been transmitted to posterity in poems and legendary tales like the Runic fragments of the north, the romances of Spain, or the heroic ballads of our own country. Such materials as these, we imagine, may have suggested to Firdausi, the celebrated heroic poet of Persia, many of the adventures of his *Shahnamé*; which, like Homer when stript of the machinery of supernatural beings, is supposed to contain much true history, and a most undoubted picture of the superstition and manners of the times. The knowledge of these two languages has laid open to Europe all the treasures of oriental learning, and has enriched the minds of Britons with

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with Indian ſciences as much as the produce of theſe regions has increaſed their wealth and enervated their conſtitution.

91 Perſian poetry.

Before we conclude this ſection, we ſhall ſubjoin a few ſtrictures on the nature of Perſian poetry, in order to render our inquiry the more complete. The modern Perſians borrowed their poetical meaſures from the Arabs: they are exceedingly various and complicated; they conſiſt of 19 different kinds; but the moſt common of them are the *Iambic* or *Trochaic* meaſure, and a metre that chiefly conſiſts of thoſe compounded feet which the ancients called Επιτριτυς, which are compoſed of iambics and ſpondees alternately. In lyric poetry their verſes generally conſiſt of 12 or 16 ſyllables: they ſometimes, but ſeldom, conſiſt of 14. Some of their lyric verſes contain 13 ſyllables; but the moſt common Perſian verſe is made up of 11; and in this meaſure are written all their great poems, whether upon heroic or moral ſubjects, as the works of Firdauſi and Jami, the Boſtar of Sadi, and the Meſnavi of Gelaleddin. This ſort of verſe anſwers to our common heroic rhyme, which was brought to ſo high a degree of perfection by Pope. The ſtudy of the Perſian poetry is ſo much the more neceſſary, as there are few books or even letters written in that language, which are not interſperſed with fragments of poetry. As to their proſody, nothing can be more eaſy and ſimple. When the ſtudent can read proſe eaſily, he will with a little attention read poetry with equal facility.

SECT. V. *Sanſcrit and Bengaleſe Languages.*

92 The Sanſcrit one of the moſt ancient languages in the world.

THE Sanſcrit, though one of the moſt ancient languages in the world, was little known even in Aſia till about the middle of the preſent century. Since that period, by the indefatigable induſtry of the very learned and ingenious Sir William Jones and the other worthy members of that ſociety of which he has the honour to be preſident, that noble and ancient language has at length been brought to light; and from it vaſt treaſures of oriental knowledge will be communicated both to Europe and Aſia; knowledge which, without the exertions of that happy eſtabliſhment, muſt have lain concealed from the reſearches of mankind to the end of the world. In this ſection we propoſe to give to our readers ſuch an account of that language as the limits of the preſent article, and the helps we have been able to procure, ſhall permit.

The Sanſcrit language has for many centuries lain concealed in the hands of the bramins of Hindoſtan. It is by them deemed ſacred, and is of conſequence confined ſolely to the offices of religion. Its name imports the *perfect language*, or, according to the eaſtern ſtyle, *the language of perfection*; and we believe no language ever ſpoken by man is more juſtly intitled to that high epithet.

93 Traces of Sanſcrit in every diſtrict of Aſia and elſewhere.

The grand ſource of Indian literature, and the parent of almoſt every dialect from the Perſian gulf to the China ſeas, is the Sanſcrit; a language of the moſt venerable and moſt remote antiquity, which, though at preſent ſhut up in the libraries of the bramins, and appropriated ſolely to the records of their religion, appears to have been current over moſt of the oriental world. Accordingly traces of its original extent may be diſcovered in almoſt every diſtrict of Aſia. Thoſe who are acquainted with that language have often found the ſimilitude of Sanſcrit words to thoſe of Perſian and Arabic, and even of Latin and Greek; and that not in technical and metaphorical terms, which refined arts and improved manners might have occaſionally introduced, but in the main ground-work of language, in monoſyllables, the names of numbers, and appellations of ſuch things as would be firſt diſcriminated on the immediate dawn of civilization.

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The ancient coins of many different and diſtant kingdoms of Aſia are ſtamped with Sanſcrit characters, and moſtly contain alluſions to the old Sanſcrit mythology. Beſides, in the names of perſons and places, of titles and dignities, which are open to general notice, even to the fartheſt limits of Aſia, may be found manifeſt traces of the Sanſcrit. The ſcanty remains of Coptic antiquities afford little ſcope for compariſon between that idiom and this primitive tongue; but there ſtill exiſts ſufficient ground to conjecture, that, at a very early period, a correſpondence did ſubſiſt between theſe two nations. The Hindoos pretend, that the Egyptians frequented their country as diſciples, not as inſtructors; that they came to ſeek that liberal education and thoſe ſciences in Hindoſtan, which none of their own countrymen had ſufficient knowledge to impart. Perhaps we may examine the validity of this claim hereafter.

But though numberleſs changes and revolutions have from time to time convulſed Hindoſtan, that part of it which lies between the Indus and the Ganges ſtill preſerves that language whole and inviolate. Here they ſtill offer a thouſand books to the peruſal of the curious; many of which have been religiouſly handed down from the earlieſt periods of human exiſtence. 94 Number of books in that language.

The fundamental part of the Sanſcrit language is divided into three claſſes: *Dhaat*, or roots of verbs, which ſome call primitive elements; *Shubd*, or original nouns; and *Eeya*, or particles. The latter are ever indeclinable, as in other languages; but the words comprehended in the two former claſſes muſt be prepared by certain additions and inflexions to fit them for a place in compoſition. And here it is that the art of the grammarian has found room to expand itſelf, and to employ all the powers of refinement. Not a ſyllable, not a letter, can be added or altered but by regimen; not the moſt trifling variation of the ſenſe, in the minuteſt ſubdiviſion of declenſion or conjugation, can be effected without the application of ſeveral rules: all the different forms for every change of gender, number, caſe, perſon, tenſe, mood, or degree, are methodically arranged for the aſſiſtance of the memory, according to an unerring ſcale. The number of the radical or elementary parts is about 700; and to theſe, as to the verbs of other languages, a very plentiful ſtock of verbal nouns owes its origin; but theſe are not thought to exceed thoſe of the Greek either in quantity or variety. 95 Characteriſtics of it.

To the triple ſource of words mentioned above, every term of truly Indian original may be traced by a laborious and critical analyſis. All ſuch terms as are thoroughly proved to bear no relation to any one of the Sanſcrit roots, are conſidered as the production of ſome remote and foreign idiom, ſubſequently ingrafted upon the main ſtock; and it is conjectured, that a judicious inveſtigation of this principle would throw a new

light

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light upon the firſt invention of many arts and ſciences, and open a freſh mine of philological diſcoveries. We ſhall now proceed to give as exact an account of the conſtituent parts of this language as the nature of our deſign will permit.

96 It is copious and nervous.

The Sanſcrit language is very copious and nervous. The firſt of theſe qualities ariſes in a great meaſure from the vaſt number of compound words with which it is almoſt overſtocked. "The Sanſcrit (ſays Sir William Jones) like the Greek, Perſian, and German, delights in compounds; but to a much higher degree, and indeed to ſuch exceſs, that I could produce words of more than 20 ſyllables; not formed ludicrouſly like that by which the buffoon in Ariſtophanes deſcribes a feaſt, but with perfect ſeriouſneſs, on the moſt ſolemn occaſions, and in the moſt elegant works." But the ſtyle of its beſt authors is wonderfully conciſe. In the regularity of its etymology it far exceeds the Greek and Arabic; and, like them, has a prodigious number of derivatives from each primary root. The grammatical rules alſo are numerous and difficult, though there are not many anomalies. As one inſtance of the truth of this aſſertion, it may be obſerved, that there are ſeven declenſions of nouns, all uſed in the ſingular, the dual, and the plural numbers, and all of them differently formed, according as they terminate with a conſonant, with a long or a ſhort vowel; and again, different alſo as they are of different genders: not a nominative caſe can be formed to any one of theſe nouns without the application of at leaſt four rules, which vary likewiſe with each particular difference of the nouns, as above ſtated: add to this, that every word in the language may be uſed through all the ſeven declenſions, which is a full proof of the difficulty of the idiom.

The Sanſcrit grammars are called *Beeākërun*, of which there are many compoſed by different authors; ſome too abſtruſe even for the comprehenſion of moſt bramins, and others too prolix to be ever uſed as references. One of the ſhorteſt, named the *Sārăſootee*, contains between two and three hundred pages, and was compiled by Anoŏbhōō ēē Seroopĕnām Achārige, with a conciſeneſs that can ſcarcely be paralleled in any other language.

97 Sanſcrit alphabet.

The Sanſcrit alphabet contains 50 letters; and it is one boaſt of the bramins, that it exceeds all other alphabets in this reſpect: but it muſt be obſerved, that as of their 34 conſonants, near half carry combined ſounds, and that ſix of their vowels are merely the correſpondent long ones to as many which are ſhort, the advantage ſeems to be little more than fanciful. Beſides theſe, they have a number of characters which Mr Halhed calls connected vowels, but which have not been explained by the learned preſident of the Aſiatic Society.

*Plate CCCCXVI.

The Sanſcrit character uſed in Upper Hindoſtan* is ſaid to be the ſame original letter that was firſt delivered to the people by Brahma, and is now called *Diewnāgur*, or the language of angels, which ſhows the high opinion that the bramins have entertained of that character. Their conſonants and vowels are wonderfully, perhaps whimſically, modified and diverſified; to enumerate which, in this place, would contribute very little either to the entertainment or inſtruction of our readers. All theſe diſtinctions are marked in the *Beids* (L), and muſt be modulated accordingly; ſo that they produce all the effect of a laboured recitative: but by an attention to the muſic of the chant, the ſenſe of the paſſage recited equally eſcapes the reader and the audience. It is remarkable, that the Jews in their ſynagogues chant the Pentateuch in the ſame kind of melody; and it is ſuppoſed that this uſage has deſcended to them from the remoteſt ages.

98 Poetry.

The Sanſcrit poetry comprehends a very great variety of different metres, of which the moſt common are theſe:

The *munnee hurreneh chhund*, or line of 12 or 19 ſyllables, which is ſcanned by three ſyllables in a foot, and the moſt approved foot is the anapæſt.

The *cābee chhund*, or line of eleven ſyllables.

The *anūſhtoſe chhund*, or line of eight ſyllables.

The poems are generally compoſed in ſtanzas of four lines, called *aſhlogues*, which are regular or irregular.

The moſt common aſhlogue is that of the *anūſhtoſe chhund*, or regular ſtanza of eight ſyllables in each line. In this meaſure the greateſt part of the *Māhābāret* is compoſed. The rhyme in this kind of ſtanza ſhould be alternate; but the poets do not ſeem to be very nice in the obſervance of a ſtrict correſpondence in the ſounds of the terminating ſyllables, provided the feet of the verſe are accurately kept.

This ſhort *anūſhtoſe aſhlogue* is generally written by two verſes in one line, with a pauſe between; ſo the whole then aſſumes the form of a long diſtich.

The irregular ſtanza is conſtantly called *anuāchhund*, of whatever kind of irregularity it may happen to conſiſt. It is moſt commonly compounded of the long line *cābee chhund* and the ſhort *anūſhtoſe chhund* alternately; in which form it bears ſome reſemblance to the moſt common lyric meaſure of the Engliſh.

Perhaps our readers may feel a curioſity to be informed of the origin of this oriental tongue. If we believe the bramins themſelves, it was coeval with the race of man, as was obſerved towards the beginning of this ſection. The bramins, however, are not the only people who aſcribe a kind of eternity to their own particular dialect. We find that the Sanſcrit in its primitive deſtination was appropriated to the offices of religion. It is indeed pretended, that all the other dialects ſpoken in Hindoſtan were emanations from that fountain, to which they might be traced back by a ſkilful etymologiſt.

99 Origin of this tongue.

This, we think, is an argument of no great conſequence, ſince we believe that all the languages of Europe, by the ſame proceſs, may be deduced from any one of thoſe current in that quarter of the globe. By a parity of reaſon, all the different dialects of Hindoſtan may be referred to the language in queſtion. Indeed, if we admit the authority of the Moſaic hiſtory, all languages whatſoever are derived from that of the firſt man. It is allowed that the language under conſideration is impregnated with Perſian, Chaldaic, Phœnician, Greek, and

(L) The books which contain the religion of the bramins.

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and even Latin idioms. This, we think, affords a prefumption that the Sanfcrit was one of thofe original dialects which were gradually produced among the defcendants of Noah, in proportion as they gradually receded from the centre of population. What branch or branches of that family emigrated to Hindoftan, it is not eafy to determine. That they were a party of the defcendants of Shem is moft probable, becaufe the other fepts of his pofterity fettled in that neighbourhood. The fum then is, that the Hindoos were a colony confifting of the defcendants of the patriarch Shem.

It appears, however, by almoft numberlefs monuments of antiquity ftill exifting, that at a very early period a different race of men had obtained fettlements in that country. It is now generally admitted, that colonies of Egyptians had peopled a confiderable part of Hindoftan. Numberlefs traces of their religion occur everywhere in thofe regions. The very learned prefident himfelf is pofitive, that veftiges of thofe facerdotal wanderers are found in India, China, Japan, Tibet, and many parts of Tartary. Thofe colonifts, it is well known, were zealous in propagating their religious ceremonies wherever they refided, and wherever they travelled. There is at the fame time even at this day a ftriking refemblance between the facred rites of the vulgar Hindoos and thofe of the ancient Egyptians. The prodigious ftatues of Salfette and Elephanta fabricated in the Egyptian ftyle; the vaft excavations hewn out of the rock in the former; the woolly hair of the ftatues, their diftorted attitudes, their grotefque appearances, their triple heads, and various other configurations —plainly indicate a foreign original. Thefe phenomena fuit no other people on earth fo exactly as the fons of Mizraim. The Egyptian priefts ufed a facred character, which none knew but themfelves; none were allowed to learn except their children and the choice of the initiated. All thefe features mark an exact parallel with the bramins of the Hindoos. Add to this, that the drefs, diet, luftrations, and other rites of both fects, bore an exact refemblance to each other. Sir William Jones has juftly obferved, that the letters of the Sanfcrit, ftript of all adventitious appendages, are really the fquare Chaldaic characters. We learn from Caffiodorus * the following particulars: "The height of the obelifks is equal to that of the circus; now the higher is dedicated to the fun, and the lower to the moon, where the facred rites of the ancients are intimated by Chaldaic fignatures by way of letters." Here then it is plain that the facred letters of the Egyptians were Chaldaic, and it is allowed that thofe of the bramins were of the fame complexion; which affords a new prefumption of the identity of the Sanfcrit with thofe juft mentioned.

* Lib. iii. epift. 2. et 51.

That the Egyptians had at a very early period penetrated into Hindoftan, is univerfally admitted. Ofiris, their celebrated monarch and deity, according to their mythology, conducted an army into that country; taught the natives agriculture, laws, religion, and the culture of the vine, &c. He is faid at the fame time to have left colonies of priefts, as a kind of miffionaries, to inftruct the people in the ceremonies of religion. Sefoftris, another Egyptian potentate, likewife overran Hindoftan with an army, and taught the natives many ufeful arts and fciences. When the paftor-kings invaded and conquered Egypt, it is probable that numbers of the priefts, in order to avoid the fury of the mercilefs invaders, who demolifhed the temples and perfecuted the minifters of religion, left their native country, and tranfported themfelves into India. Thefe, we fhould think, were the authors both of the language and religion of the bramins. This dialect, as imported by the Egyptians, was probably of the fame cont[illegible]ture with the facred language of that people, as it appeared many ages after. The Indians, who have alw[illegible]s been an inventive and induftrious race of men, in procefs of time cultivated, improved, diverfified, and conftructed that language with fuch care and affiduity, that it gradually arrived at that high degree of perfection in which at prefent it appears.

Had the learned prefident of the Afiatic Society (M), when he inftituted a comparifon between the deities of Hindoftan on the one fide and of Greece and Italy on the other, examined the analogy between the gods of Hindoftan and thofe of Egypt, we think he would have performed a piece of fervice ftill more eminent. Having firft demonftrated the fimilarity between the divinities of India and Egypt, he might then have proceeded to inveftigate the refemblance of the Egyptian and Phœnician with thofe of Greece and Rome. By this procefs a chain would have been formed which would have conducted his reader to comprehend at one view the identity of the Zabian worfhip almoft throughout the world.

We forefee that it will be objected to this hypothefis, that all the dialects of Hindoftan being clearly reducible to the Sanfcrit, it is altogether impoffible that it could have been a foreign language. To this we anfwer, that at the early period when this event is fuppofed to have taken place, the language of the pofterity of the fons of Noah had not deviated confiderably from the primitive ftandard, and confequently the language of the Egyptians and the Hindoos was nearly the fame. The Sanfcrit was gradually improved; the language of the vulgar, as is always the cafe, became more and more different from the original archetype; but ftill retained fuch a near refemblance to the mother-tongue as proved the verity of its extraction.

120
Bengalefe language derived from the Sanfcrit.

To the preceding account of the Sanfcrit language we fhall annex a few ftrictures on the language of Bengal, which we believe is derived from the other, and is in moft common ufe in the fouthern parts of Hindoftan.

Though moft of the ancient oriental tongues are read from right to left, like the Hebrew, Chaldaic, Arabic, &c. yet fuch as properly belong to the whole continent of India proceed from left to right like thofe of Europe. The Arabic, Perfian, &c. are the grand fources whence the former method has been derived; but with thefe, the numerous original dialects of Hindoftan have not the fmalleft connection or refemblance.

The great number of letters, the complex mode of combination, and the difficulty of pronunciation, are confiderable

(M) See that gentleman's difcourfe, *Refearches*, vol. i.

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conſiderable impediments to the ſtudy of the Bengal language; and the careleſſneſs and ignorance of the people, and the inaccuracy of their characters, aggravate theſe inconveniences. Many of their characters are ſpurious; and theſe, by long uſe and the hurry of buſineſs, are now almoſt naturalized into the language.

101 Bengal alphabet.

The Bengal alphabet, like that of the Sanſcrit, from which it is derived, conſiſts of 50 letters, whoſe form, order, and ſound, may be learned from Mr Halhed's grammar of the Bengal language. The vowels are divided into long and ſhort, the latter of which are often omitted in writing. Moſt of the oriental languages are conſtructed upon the ſame principle, with reſpect to the omiſſion of the ſhort vowel. The Hebrews had no ſign to expreſs it before the invention of the Maſoretic points; in Arabic it is rarely inſerted unleſs upon very ſolemn occaſions, as in the Koran; in the modern Perſian it is univerſally omitted: ſo to all the conſonants in the Sanſcrit, the ſhort vowel is an invariable appendage, and is never ſignified by any diacritical mark; but where the conſtruction requires that the vowel ſhould be dropped, a particular ſtroke is ſet under the letter. It is in vain to pretend, in a ſketch like this, to detail the ſound and pronunciation of theſe letters: this muſt be acquired by the ear and by practice.

102 Genders, &c. of this language.

In the Bengal language there are three genders, as in Greek, Arabic, &c. The authors of this threefold diviſion of genders, with reſpect to their precedence, appear to have conſidered the neuter as a kind of reſiduum reſulting from the two others, and as leſs worthy or leſs comprehenſive than either (ſee ſection of the *Greek*). The terminations uſually applied upon this occaſion are *aa* for the maſculine, and *ee* for the feminine. In Sanſcrit, as in Greek and Latin, the names of all things inanimate have different genders, founded on vague and incomprehenſible diſtinctions: the ſame is the caſe with the Bengal.

103 Peculiarities of Sanſcrit and Bengaleſe nouns.

A Sanſcrit noun, on its firſt formation from the general root, exiſts equally independent of caſe as of gender. It is neither nominative, nor genitive, nor accuſative; nor is impreſſed with any of thoſe modifications which mark the relation and connection between the ſeveral members of a ſentence. In this ſtate it is called an *imperfect* or *crude* noun. To make a nominative of a word, the termination muſt be changed and a new form ſupplied. Thus we ſee, that, in the Sanſcrit at leaſt, the nominative has an equal right with any other inflection to be called a caſe. Every Sanſcrit noun has ſeven caſes, excluſive of the vocative; and therefore comprehends two more than even thoſe of the Latin. Mr Halhed above mentioned details all the varieties of theſe with great accuracy, to whoſe grammar we muſt refer our readers. The Bengal has only four caſes beſide the vocative; in which reſpect it is much inferior to the other.

It would be difficult to account for the variety of words which have been allotted to the claſs of pronouns by European grammarians. The firſt and ſecond perſon are chiefly worthy of obſervation; theſe two ſhould ſeem to be confined to rational and converſable beings only: the third ſupplies the place of every object in nature; wherefore it muſt neceſſarily be endued with a capacity of ſhifting its gender reſpectively as it ſhifts the ſubject; and hence it is in Sanſcrit frequently denominated an adjective. One of the demonſtratives *hic* or *ille* uſually ſerves for this purpoſe; and generally the latter, which in Arabic has no other name than *dhemeer el ghaayb*, "the pronoun of the abſentee," for whoſe name it is a ſubſtitute.

104 Bengaleſe pronouns.

In moſt languages where the verb has a ſeparate inflection to each perſon, that inflection is ſufficient to aſcertain the perſonality; but in Bengal compoſitions, though the firſt and ſecond perſons occur very frequently, nothing is more rare than the uſage of the pronoun of the third; and names of perſons are inſerted with a conſtant and diſguſting repetition, to avoid, as it ſhould ſeem, the application of the words HE and SHE. The ſecond perſon is always ranked before the firſt, and the third before the ſecond. The perſonal pronouns have ſeven caſes, which are varied in a very irregular manner. Leaving theſe to the Bengalian grammar, we ſhall proceed to the *verb*.

The Sanſcrit, the Arabic, the Greek and Latin verbs, are furniſhed with a ſet of inflections and terminations ſo comprehenſive and ſo complete, that by their form alone they can expreſs all the different diſtinctions both of perſons and time. Three ſeparate qualities in them are perfectly blended and united. Thus by their root they denote a particular act, and by their inflection both point out the time when it takes place and the number of the agents. In Perſian, as in Engliſh, the verb admits but of two forms, one for the preſent tenſe and one for the aoriſt; and it is obſervable, that while the paſt tenſe is provided for by a peculiar inflection, the future is generally ſupplied by an additional word conveying only the idea of time, without any other influence on the act implied by the principal verb. It is alſo frequently neceſſary that the different ſtate of the action, as perfect or imperfect, be further aſcertained in each of the tenſes, paſt, preſent, and future. This alſo, in the learned languages, is performed by other variations of inflections, for which other verbs and other particles are applied in the modern tongues of Europe and Perſia.

105 Middle voice of Sanſcrit verbs.

Every Sanſcrit verb has a form equivalent to the middle voice of the Greek, uſed through all the tenſes with a reflective ſenſe, and the former is even the moſt extenſive of the two in its uſe and office: for in Greek the reflective can only be adopted intranſitively when the action of the verb deſcends to no extraneous ſubject; but in Sanſcrit, the verb is both reciprocal and tranſitive at the ſame time.

Neither the Sanſcrit, nor the Bengaleſe, nor the Hindoſtanic, have any word preciſely anſwering to the ſenſe of the verb *I have*, and conſequently the idea is always expreſſed by *eſt mihi*; and of courſe there is no auxiliary form in the Bengal verb correſpondent to *I have written*, but the ſenſe is conveyed by another mode. The very ſubſtantive, in all languages, is defective and irregular, and therefore the Sanſcrit calls it a *ſemi-verb*. It is curious to obſerve that the preſent tenſe of this verb, both in Greek and Latin, and alſo in the Perſian, appears plainly to be derived from the Sanſcrit. In the Bengaleſe, this verb has but two diſtinctions of time, the preſent and the paſt; the terminations of the ſeveral perſons of which ſerve as a model for thoſe of the ſame tenſe in all other verbs reſpectively.

106 Characteriſtics of the Bengaleſe verbs.

Verbs of the Bengal language may be divided into three claſſes, which are diſtinguiſhed by their penultimate letter. The ſimple and moſt common form has an

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an open consonant immediately preceding the final letter of the infinitive. The second is composed of those words whose final letter is preceded by another vowel or open consonant going before it. The third consists entirely of causals derived from verbs of the first and second conjugations. The reader will easily guess at the impossibility of prosecuting this subject to any greater length: we shall therefore conclude with a few remarks collected from the grammar so often mentioned, which we apprehend may be more amusing, if not more instructing.

The Greek verbs in *μι* are formed exactly upon the same principle with the Sanscrit conjugations, even in the minutest particulars. Instances of this are produced in many verbs, which from a root form a new verb by adding the syllable *mi*, and doubling the first consonant. This mode furnishes another presumption of the Egyptian origin of the Sanscrit. Many Greeks travelled into Egypt; many Egyptian colonies settled in Greece. By one or other of those channels the foregoing innovation might have been introduced into the Greek language.

To form the past tense, the Sanscrit applies a syllabic augment, as is done in the Greek: the future has for its characteristic a letter analogous to that of the same tense in the Greek, and it omits the reduplication of the first consonant. It may be added, that the reduplication of the first consonant is not constantly applied to the present tense of the Sanscrit more than to those of the Greek.

The natural simplicity and elegance of many of the Asiatic languages are greatly debased and corrupted by the continual abuse of auxiliary verbs; and this inconvenience has evidently affected the Persian, the Hindostan, and the Bengal idioms.

The infinitives of verbs in the Sanscrit and Bengalese are always used as substantive nouns. Every body knows that the same mode of arrangement very often occurs in the Greek.

In the Sanscrit language, as in the Greek, there are forms of infinitives and of participles comprehensive of time; there are also other branches of the verb that seem to resemble the gerunds and supines of the Latin.

All the terms which serve to qualify, to distinguish, or to augment, either *substance* or *action*, are classed by the Sanscrit grammarians under one head; and the word used to express it literally signifies *increase* or *addition*. According to their arrangement, a simple sentence consists of three members; the *agent*, the *action*, the *subject*; which, in a grammatical sense, are reduced to two; the *noun* and the *verb*. They have a particular word to specify such words as amplify the noun which imports quality, and answers to our *adjectives* or *epithets*: Such as are applied to denote relation or connection, are intimated by another term which we may translate *preposition*.

107 Sanscrit and Bengalese adjectives.

The adjectives in Bengalese have no distinction of gender or number; but in Sanscrit these words preserve the distinction of gender, as in the Greek and Latin.

Prepositions are substitutes for cases, which could not have been extended to the number necessary for expressing all the several relations and predicaments in which a noun may be found, without causing too much embarrassment in the form of a declension. Those are too few in the Greek language, which occasions much inconvenience. See sect. *Greek*.

The Latin is less polished than the Greek, and of consequence bears a much nearer resemblance to the Sanscrit, both in words, inflections, and terminations.

The learned are now convinced that the use of numerical figures was first derived from India. Indeed the antiquity of their application in that country far exceeds the powers of investigation. All the numerals in Sanscrit have different forms for the different genders, as in Arabic. There appears a strong probability that the European method of computation was derived from India, as it is much the same with the Sanscrit, though we think the Europeans learned it from the Arabians. The Bengalese merchants compute the largest sums by *fours*; a custom evidently derived from the original mode of computing by the fingers.

The Sanscrit language, among other advantages, has a great variety in the mode of arrangement; and the words are so knit and compacted together, that every sentence appears like one complete word. When two or more words come together *in regimine*, the last of them only has the termination of a case; the others are known by their position; and the whole sentence so connected, forms but one compound word, which is called a *foot*.

Sect. VI. *Of the Chinese Language.*

108 Antiquity of the Chinese.

THE Chinese, according to the most authentic accounts, are a people of great antiquity. Their situation was such, as, in the earliest ages of the world, in a great measure secured them from hostile invasion. Their little commerce with the rest of mankind precluded them the knowledge of those improvements which a mutual emulation had often generated among other nations, who were situated in such a manner, with relation to each other, as served to promote a mutual intercourse and correspondence. As China is a large and fertile country, producing all the necessaries, conveniencies, and even the luxuries of life, its inhabitants were not under the necessity of looking abroad for the two former, nor exposed to the temptation of engaging in foreign commerce, in order to procure the latter. Perfectly satisfied with the articles which their own country produced, they applied themselves entirely to the practice of agriculture and other arts connected with that profession; and their frugality, which they retain even to this day, taught them the lesson of being contented with little; of consequence, though their population was almost incredible, the produce of their soil was abundantly sufficient to yield them a subsistence. Their inventions were their own; and as they borrowed nothing from other people, they gradually began to despise the rest of mankind, and, like the ancient Egyptians, branded them with the epithet of *barbarians*.

Those people had at an early period made amazing proficiency in the mechanical arts. Their progress in the liberal sciences, according to the latest and indeed the most probable accounts, was by no means proportioned. In mathematics, geometry, and astronomy, their knowledge was contemptible; and in ethics, or moral philosophy, the complexion of their laws and customs

Chinese Language. customs proves their skill to have been truly superficial. They value themselves very highly at present upon their oratorial talents; and yet of all languages spoken by any civilized people, theirs is confessedly the least improved. To what this untowardly defect is owing, the learned have not yet been able to determine.

109 Their language an original tongue. The language of the Chinese is totally different from those of all other nations, and bears very strong marks of an original tongue. All its words are monosyllabic, and compositions and derivations are altogether unknown. Their nouns and verbs admit of no flexions; in short, every thing relating to their idioms is peculiar, and incapable of being compared with any other dialect spoken by any civilized people. Most barbarous languages exhibit something that resembles an attempt towards those diacritical modifications of speech; whereas the Chinese, after a space of 4000 years, have not advanced one step beyond the very first elements of ideal communication. This circumstance, we think, is a plain demonstration that they did not emigrate from that region where the primitive race of mankind is thought to have fixed its residence. Some have imagined, we believe with good reason, that they are a *Tartarian* race, which, breaking off from the main body of that numerous and widely extended people, directed their march towards the south-east. There, falling in with delightful and fertile plains which their posterity now inhabit, they found themselves accommodated so much to their liking, that they dropped all desire of changing their habitations. The country of China is, indeed, so environed with mountains, deserts, and seas, that it would have been difficult for men in their primitive state to have emigrated into any of the neighbouring regions. Thus secluded from the rest of mankind, the Chinese, in all probability, were left to the strength of their own inventive powers to fabricate a language, as well as the other arts and improvements necessary for the support and convenience of life.

It is indeed obvious that their stock of vocables, when they emigrated from Tartary, was neither ample nor properly accommodated to answer the purposes of the mutual conveyance of ideas. With this slender stock, however, they seem to have been satisfied; for it does not appear that any additions were afterwards made to that which was originally imported. Instead of framing a new race of terms by compounding their primitive ones; instead of diversifying them by inflections, or multiplying them by derivatives, as is done in every other language; they rather chose to retain their primitive words, and by a variety of modifications introduced upon their orthography or pronunciation, to accommodate them to a variety of significations. Were it possible to scrutinize all the Tartarian dialects, and to reduce them to their primitive monosyllabic character, perhaps the original language of the Chinese might be investigated and ascertained. We know that attempts have been made to compare it with some of the other Asiatic languages, especially the *Hebrew*: This labour has, however, proved unsuccessful, and no primeval identity has been discovered. Before this comparison could be instituted with the most distant prospect of success, the language last mentioned must be stripped of all its adventitious qualities; and not only so, but it must be reduced to the monosyllabic tone, and then contrasted with the Chinese monosyllables; an undertaking which we are persuaded would not be readily executed. After all, we are convinced that no resemblance of any importance would be discovered.

110 Process of its fabrication. The Chinese language must then, in our opinion, have been a Tartarian dialect, as the people themselves were colonists from Tartary. We have observed above, that those people have not hitherto found out the art of composition of words. This is the more surprising, when we consider that, in the characters which form their written language, they employ many compositions. For example, the character by which they represent *misfortune*, is composed of one hieroglyphic which represents a *house*, and another which denotes *fire*; because the greatest misfortune that can befal a man is to have his house on fire. With respect to the language which they use in speech, though they very often employ many words to express one thing, yet they never run them together into one word, making certain changes upon them that they may incorporate the more conveniently, but always preserve them entire and unaltered.

111 Paucity of its words. The whole number of words in the Chinese language does not exceed 1200: the nouns are but 326. It must certainly appear surprising, that a people whose manners are so highly polished and refined, should be able to express so many things as must of necessity attend such a course of life by so small a number of words, and those too monosyllables. The difficulties which attend this singular mode must be felt almost every instant; circumstances which, according to the ordinary course of things, should have induced them to attempt both an augmentation of the number of their words and an extension of those which they had by composition and derivation. We learn from Du Halde* that the Chinese have two different dialects: the one vulgar, which is spoken by the vulgar, and varies according to the different provinces; the other is called the *Mandarin language*, and is current only among the learned. The latter is properly that which was formerly spoken at court in the province of *Kiang-nan*, and gradually spread among the polite people in the other provinces. Accordingly, this language is spoken with more elegance in the provinces adjoining to *Kiang-nan* than in any other part of the kingdom. By slow degrees it was introduced into all parts of the empire, and consequently became the universal language.

It then appears that the modern language of China was originally the court dialect, and utterly unknown to the bulk of the people. From this circumstance we think it may fairly be concluded that this dialect was deemed the royal tongue, and had been fabricated on purpose to distinguish it from the vulgar dialects. We learn from Heliodorus, that the † Ethiopians had a royal language which was the same with the sacred idiom of the Egyptians. This Mandarin tongue was originally an artificial dialect fabricated with a view to enhance the majesty of the court, and to raise its very style and diction above that of the rest of mankind. The Chinese, a wonderfully inventive people, might actually contrive a language of that complexion, with an intention to render it obscure and

* *Hist. of China*, vol. ii.

† *Ethiop.* lib. vi.

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and enigmatical (N). Such a plan would excite their admiration, and would at the fame time greatly exceed their comprehenfion. In procefs of time, when the Chinefe empire was extended, the Mandarins who had been brought up at court, and underftood nothing of the provincial dialects, found it convenient to have the moft eminent perfons in every province taught the language employed by themfelves, in order to qualify them for tranfacting the affairs of government with them in a language which both underftood. By this means the royal dialect defcended to the vulgar, and in procefs of time became univerfal. The Tartar dialect formerly in ufe vanifhed; only a few veftiges of it remained; which gradually incorporating with the royal language, occafioned the variation of provincial tongues above mentioned.

We are therefore clearly of opinion, that the modern language of the Chinefe was deduced from the original Mandarin, or court dialect, and that this laft was an artificial fpeech fabricated by the fkill and ingenuity of that wonderful people. The learned have long held it up as the primary dialect, becaufe, fay they, it bears all the fignatures of an original unimproved language. In our opinion, nothing appears more ingenioufly artificial. It is univerfally allowed that, in its ftructure, arrangement, idioms, and phrafeology, it refembles no other language. Is not every learned man now convinced that all the Afiatic languages yet known, difcover unequivocal fymptoms of their cognation and family refemblance? The Ethiopians, Chaldeans, Arabians, Perfians, Egyptians, Hebrews, Phœnicians, the Brahmans, Bengalefe, the Hindoos bordering upon China, all fpeak only different dialects of one language, varying from the original in dialect only, fome in a greater fome in a leffer degree: why fhould the Chinefe alone ftand altogether infulated and unallied?

The languages of the North all wear congenial features. The Tartar or Tatar dialects of every clan, of every canton, of ever denomination, exhibit the moft palpable proofs of a near affinity: the Gothic and Sclavonian dialects, which pervade a great part of Europe and fome parts of Afia, are obvioufly brethren, and may eafily be traced up to an Afiatic original. Even fome of the American jargon dialects contain vocables which indicate an Afiatic or European original. Our readers, we flatter ourfelves, will agree with us, that had the language of the Chinefe been the original language, a refemblance muft have ftill exifted between it and its defcendants. If it had originated from any other language, it would have retained fome characteriftic features of its parent archetype. As neither of thefe is to be found in the fabric of the language under confideration, the conclufion muft be, that it is a language entirely different from all other tongues; that it is conftructed upon different principles, defcended from different parents, and framed by different artifts.

The Chinefe themfelves have a common and immemorial tradition, that their language was framed by *Yao* their firft emperor, to whom they attribute the invention of every thing curious, ufeful, and ornamental. Traditional hiftory, when it is ancient, uniform, and univerfal, is generally well founded: upon this occafion we think the tradition above mentioned may be fairly admitted as a collateral evidence.

112 A proof of its artificial ftructure.

The paucity of vocables contained in this fingular language, we think another prefumption of its artificial contexture. The Chinefe *Onomathetæ* would find it an arduous tafk to devife a great number of new terms, and would therefore reft fatisfied with the fmalleft number poffible. In other languages we find the like economy was obferved. Rather than fabricate new words, men chofe fometimes to adapt old words to new, and, upon fome occafions, even to contrary fignifications. To fpare themfelves the trouble of coining new terms, they contrived to join feveral old ones into one; whence arofe a numerous race of compounds. Derivatives too were fabricated to anfwer the fame purpofe. By this procefs, inftead of creating new vocables, old ones were compounded, diverfified, deflected, ramified, metamorphofed, and tortured into a thoufand different fhapes.

The Greek is defervedly efteemed a rich and copious language; its radical words have been curioufly traced by feveral learned men, who, after the moft laborious and exact fcrutiny, have found that they do not amount to more than 300. The Sanfcrit language is highly compounded; its radical terms, however, are very few in number. Upon the whole, we think we may conclude, that the more any language abounds in compounds and derivatives, the fmaller will be the number of its radical terms. The Arabic admits of no compofition, and of confequence its words have been multiplied almoft *in infinitum*; the Sanfcrit, the Perfian, and the Greek, abound with compounds, and we find their radicals are few in proportion.

113 Three different methods of enriching a language.

There are, we think, three different methods which may be employed in order to enrich and extend the range of a language. 1ft, By fabricating a multitude of words; the plan which has been purfued by the Arabs. 2d, By framing a multitude of compounds and derivatives; the artifice employed by the Greeks and the authors of the Sanfcrit. 3d, By varying the fignification of words without enlarging their number; the method practifed by the Chinefe and their colonifts. The Arabians, we think, have fhown the moft fertile and inventive genius, fince they have enriched their language by actually creating a new and a moft numerous race of words. The fabricators of the Sanfcrit and the collectors of the Greek have exhibited art, but *comparatively* little fertility of genius. Leaving, therefore, the Arabians, as in juftice we ought, mafters of the field in the conteft relating to the formation of language, we may range the Greek and Sanfcrit on the one fide, and the Chinefe on the other; and having made this arrangement, we may attempt to difcover on which fide the largeft proportion of genius and invention feems to reft.

The

(N) An attempt of this nature, among a people like the Chinefe, is by no means improbable; nor is its fuccefs lefs probable. For a proof of this, we need only have recourfe to Bifhop Wilkins's Artificial Language, and Pfalmanazar's Dictionary of the language of Formofa.

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The Greek and Sanſcrit (for we have ſelected them as moſt highly compounded) exhibit a great deal of art in modifying, arranging, and diverſifying their compounds and derivatives, in ſuch a manner as to qualify them for intimating complex ideas; but the Chineſe have performed the ſame office by the help of a race of monoſyllabic notes, ſimple, inflexible, invariable, and at the ſame time few in number. The queſtion then comes to be, whether more art is diſplayed in new-modelling old words by means of declenſions, compounds, and derivatives, or by deviſing a plan according to which monoſyllabic radical terms, abſolutely invariable, ſhould, by a particular modification of ſound, anſwer all the purpoſes performed by the other. The latter appears to us much more ingeniouſly artificial. The former reſembles a complicated machine compoſed of a vaſt number of parts, congenial indeed, but looſely connected; the latter may be compared to a ſimple, uniform engine, eaſily managed, and all its parts properly adjuſted. Let us now ſee in what manner the people in queſtion managed their monoſyllabic notes, ſo as to qualify them for anſwering all the purpoſes of ſpeech.

114 That adopted by the Chineſe.

Though the number of words in the Chineſe language does not amount to above 1200; yet that ſmall number of vocables, by their artificial management, is ſufficient to enable them to expreſs themſelves with eaſe and perſpicuity upon every ſubject. Without multiplying words, the ſenſe is varied almoſt *in infinitum* by the variety of the accents, inflections, tones, aſpirations, and other changes of the voice and enunciation; circumſtances which make thoſe who do not thoroughly underſtand the language frequently miſtake one word for another. This will appear obvious by an example.

The word *teov* pronounced ſlowly, drawing out the *v* and raiſing the voice, ſignifies a *lord* or *maſter*. If it is pronounced with an even tone, lengthening the *v*, it ſignifies a *hog*. When it is pronounced quick and lightly, it imports a *kitchen*. If it be pronounced in a ſtrong and maſculine tone, growing weaker towards the end, it ſignifies a *column*.

By the ſame economy, the ſyllable *po*, according to the various accents, and the different modes of pronunciation, has eleven different ſignifications. It ſignifies *glaſs, to boil, to winnow rice, wiſe or liberal, to prepare, an old woman, to break or cleave, inclined, a very little, to water, a ſlave or captive*. From theſe examples, and from almoſt numberleſs others which might be adduced, it is abundantly evident that this language, which at firſt ſight appears ſo poor and confined, in conſequence of the ſmall number of the monoſyllables of which it is compoſed, is notwithſtanding very copious, rich, and expreſſive.

Again, the ſame word joined to various others, imports a great many different things; for example *mou*, when alone, ſignifies a *tree, wood*; but when joined with another word, it has many other ſignifications. *Mou leoo*, imports "wood prepared for building;" *mou lan* is "bars, or wooden grates;" *mou hia*, "a box;" *mou ſang*, "a cheſt of drawers;" *mou ſſiang*, "a carpenter;" *mou eul*, "a muſhroom;" *mou nu*, "a ſort of ſmall orange;" *mou ſing*, "the planet Jupiter;" *mou mien*, "cotton," &c. This word may be joined to ſeveral others, and has as many different ſignifications as it has different combinations.

Thus the Chineſe, by a different arrangement of their monoſyllables, can compoſe a regular and elegant diſcourſe, and communicate their ideas with energy and preciſion; nay even with gracefulneſs and propriety. In theſe qualities they are not excelled either by the Europeans or Aſiatics, who uſe alphabetical letters. In fine, the Chineſe ſo naturally diſtinguiſh the tones of the ſame monoſyllable, that they comprehend the ſenſe of it, without making the leaſt reflection on the various accents by which it is determined.

115 Conſequences of this method on pronunciation.

We muſt not, however, imagine, as ſome authors have related, that thoſe people cant in ſpeaking, and make a ſort of muſic which is very diſagreeable to the ear; theſe different tones are pronounced ſo curiouſly, that even ſtrangers find it difficult to perceive their difference even in the province of *Kiang-nan*, where the accent is more perfect than in any other. The nature of it may be conceived by the guttural pronunciation in the Spaniſh language, and by the different tones that are uſed in the French and Italian: theſe tones are almoſt imperceptible; they have, however, different meanings, a circumſtance which gave riſe to the proverb, that *the tone is all*.

If the fineneſs and delicacy of their tones are ſuch as to be ſcarce perceptible to a ſtranger, we muſt ſuppoſe that they do not riſe high, but only by ſmall intervals; ſo that the muſic of their language muſt ſomewhat reſemble the muſic of the birds, which is within a ſmall compaſs, but nevertheleſs of great variety of notes. Hence it will follow, that ſtrangers will find it very difficult, if not impoſſible, to learn this language; more eſpecially if they have not a delicate ear and a flexible voice, and alſo much practice. The great difference then between the Chineſe and Greek accents conſiſts in this, that the Greeks had but two accents, the grave and acute, diſtinguiſhed by a large interval, and that not very exactly marked: for the acute, though it never riſes above a fifth higher than the grave, did not always riſe ſo high, but was ſometimes pitched lower according to the voice of the ſpeaker. The Chineſe muſt have many more accents, and the intervals between them muſt be much ſmaller, and much more carefully marked; for otherwiſe it would be impoſſible to diſtinguiſh them. At the ſame time, their language muſt be much more muſical than the Greek, and perhaps more ſo than any language ought to be; but this becomes neceſſary for the purpoſes above mentioned. Du Halde is poſitive, that notwithſtanding the perpetual variation of accents in the Chineſe tongue, and the almoſt imperceptible intervals between theſe tones, their enunciation does not reſemble ſinging: many people, however, who have reſided in China, are equally poſitive that the tone with which they utter their words does actually reſemble *canting*; and this, when we conſider the almoſt imperceptible intervals by which they are perpetually raiſing and lowering the tone of their voice, appears to us highly probable.

As the people of whoſe language we are treating at preſent communicate a variety of different ſignifications to their monoſyllabic words by their different accentuation, ſo they employ quantity for the very ſame purpoſe. By lengthening or ſhortening the vowels of their words, they employ them to ſignify very different things. The ſame they perform by giving their words different aſpirations,

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rations, as likewise by sounding them with different degrees of roughness and smoothness and even sometimes by the different motion, posture, or attitude, with which their enunciation is accompanied. By these methods of diversifying their monosyllables (says Du Halde), they make 330 of them serve all the purposes of language, and these too not much varied in their termination; since all the words in that language either terminate with a vowel or with the consonant *n*, sometimes with the consonant *g* annexed.

From this account, we think it is evident that the Chinese, by a wonderful exertion of ingenuity, do, by different tones and prosodical modifications, by means of a very inconsiderable number of words, all invariable radicals, actually perform all that the most polished nations have been able to atchieve by their compounds, derivatives, &c. diversified by declensions, conjugations, and flexions of every kind; circumstances which, in our opinion, reflect the greatest honour on their inventive powers.

116 Grammar of the Chinese.

With respect to the grammar of this language, as it admits of no flexions, all their words being indeclinable, their cases and tenses are all formed by particles. They have no idea of genders; and even the distinction of numbers, which in almost all other languages, even the most unimproved, is marked by a particular word, is in the Chinese only indicated by a particle. They have only the three simple tenses, namely, the past, present, and future; and for want of different terminations, the same word stands either for the verb or the verbal substantive, the adjective or the substantive derived from it, acording to its position in the sentence.

The Chinese language being composed of monosyllables, and these indeclinable, can scarce be reduced to grammatical rules: we shall, however, attempt to lay before our readers as much of the texture of that singular dialect as may enable them to form some vague idea of its genius and constitution. We shall begin with the letters, and proceed regularly to the remaining parts as they naturally succeed each other.

117 Chinese letters or characters

The art of joining the Chinese monosyllables together is extremely difficult, and requires a very long and laborious course of study. As they have only figures by which they can express their thoughts, and have no accents in writing to vary the pronunciation, they are obliged to employ as many different figures or characters as there are different tones, which give so many different significations to the same word. Besides, some single characters signify two or three words, and sometimes even a whole period. For example, to write these words, *good morrow, Sir*, instead of joining the characters which signify *good* and *morrow* with that of *Sir*, a different character must be used, and this character alone expresses these three words. This circumstance greatly contributes to multiply the Chinese characters.

This method of joining the monosyllables is indeed sufficient for writing so as to be understood; but it is deemed trifling, and is used only by the vulgar. The style that is employed, in order to shine in composition, is quite different from that which is used in conversation, though the words are in reality the same. In writings of that species, a man of letters must use more elegant phrases, more lofty expressions, and the whole must be dignified with tropes and figures which are not in general use, but in a peculiar manner adapted to the nature of the subject in question. The characters of Cochin-china, of Tong-king, of Japan, are the same with those of the Chinese, and signify the same things; though, in speaking, these nations do not express themselves in the same manner: of consequence the language of conversation is very different, and they are not able to understand each other; while, at the same time, they understand each other's written language, and use all their books in common.

The learned must not only be acquainted with the characters that are employed in the common affairs of life, but must also understand their various combinations, and the numerous and multiform dispositions and arrangements which of several simple strokes make the compound characters. The number of their characters amounts to 80,000; and the man who knows the greatest number of them is of course the most learned. From this circumstance we may conclude, that many years must be employed to acquire the knowledge of such a prodigious number of characters, to distinguish them when they are compounded, and to remember their shape and import. After all, a person who understands 10,000 characters may express himself with tolerable propriety in this language, and may be able to read and understand a great number of books. The generality of their learned men do not understand above 15,000 or 20,000, and few of their doctors have attained to the knowledge of above 40,000. This prodigious number of characters is collected in their great vocabulary called *Hai-pien*. They have radical letters, which show the origin of words, and enable them to find out those which are derived from them: for instance, the characters of mountains, trees, man, the earth, of a horse, under which must be sought all that belongs to mountains, trees, man, &c. In this search one must learn to distinguish in every word those strokes or figures which are above, beneath, on the sides, or in the body of the radical figure.

118 Characters exceedingly numerous.

Clemens Alexandrinus (see Section *Chaldean*, &c.) informs us, that the Egyptians employed three sorts of characters: The first was called the *epistolary*, which was used in writing letters; the second was denominated *sacred*, and peculiar to the sacerdotal order; the last *hieroglyphical*, which was appropriated to monumental inscriptions and other public memorials. This mode of representation was twofold: one, and the most simple, was performed by describing the picture of the object which they intended to represent, or at least one that resembled it pretty nearly; as when they exhibited the sun by a circle and the moon by a crescent: the other was properly symbolic; as when they marked *eternity* by a serpent with his tail in his mouth, the *air* by a man clothed in an azure robe studded with stars, &c.

The Chinese, in all probability, had the same variety of characters. In the beginning of their monarchy, they communicated their ideas by drawing on paper the images of the objects they intended to express; that is, they drew the figure of a bird, a mountain, a tree, waving lines, to indicate birds, mountains, forests, rivers, &c.

There were, however, an infinite number of ideas to be communicated, whose objects do not fall under the cognizance of the senses; such as the soul, the thoughts, the

Chineſe Language. the paſſions, beauty, deformity, virtues, vices, the actions of men and other animals, &c. This inconvenience obliged them to alter their original mode of writing, which was too confined to anſwer that purpoſe, and to introduce characters of a more ſimple nature, and to invent others to expreſs thoſe things which are the objects of our ſenſes.

119 and truly hieroglyphical. Theſe modern characters are, however, truly hieroglyphical, ſince they are compoſed of ſimple letters which retain the ſignification of the primitive characters. The original character for the ſun was a circle, thus ⊙; this they called *ga*: They now repreſent that luminary by the figure 日, to which they ſtill give the original name. But human inſtitutions having annexed to theſe laſt framed characters the very ſame ideas indicated by the original ones, the conſequence is, that every Chineſe letter is actually ſignificant, and that it ſtill retains its ſignificancy, though connected with others. Accordingly the word *tſai*, which imports "misfortune, calamity," is compoſed of the letter *mien*, "a houſe," and the letter *ho*, "fire;" ſo that the ſymbolical character for misfortune is the figure of a houſe on fire. The Chineſe characters, then, are not ſimple letters without any ſignification, like thoſe of the Europeans and other Aſiatics; but when they are joined together, they are ſo many hieroglyphics, which form images and expreſs thoughts.

Upon the whole, the original characters of the Chineſe were real pictures (ſee Section of the *Egyptian* language); the next improvement was the ſymbolical character; the third and laſt ſtage is the preſent mode, in which artificial ſigns have been fabricated, in order to repreſent ſuch thoughts or ideas as could not be repreſented by one or other of the methods above deſcribed. Du Halde, vol. ii. p. 400, *et ſeq.* has furniſhed us with rules for pronouncing the Chineſe vowels and conſonants; a piece of information which, we apprehend, would be of little conſequence to our readers, and which we ſhall therefore paſs over, and proceed to give a brief account of their grammar. As the whole language is compoſed of monoſyllables, and theſe indeclinable, its grammatical ſtructure muſt be ſimple and obvious: we ſhall only mention what to us appears ſingular and important.

120 Peculiarities of the Chineſe parts of ſpeech. In the Chineſe language there is no diverſity of genders or caſes, and of conſequence no declenſions. Very often the noun is not diſtinguiſhed from the verb; and the ſame word which in one ſituation is a ſubſtantive, in another may become an adjective, and even a verb.

The adjective always goes before the ſubſtantive; but if it follow it, it becomes a ſubſtantive.

The caſes and numbers are known only by the compoſition. The plural number is diſtinguiſhed by the particle *men*, which is common to all nouns; but when the noun is preceded by ſome word that ſignifies number, the particle *men* is not annexed.

The Chineſe genitive, both ſingular and plural, when it comes after nouns, is often made by *ti*; and there is no other caſe in that language. The ſame particle is ſometimes placed after pronouns, as if they were derivatives.

The comparative degree is formed by adding the particle *keng*, which is always ſet before the noun, and ſignifies *much*. The particle *to* is ſometimes uſed, which likewiſe imports *much*. Chineſe Language.

The Chineſe have only three perſonal pronouns, *ngo*, "I," *ni*, "thou," and *ta*, "he:" theſe become plural by adding the ſyllable *men*. They are made poſſeſſive by adding the ſyllable *ti*, as *ngo ti*, "mine," *ni ti*, "thine," *ta ti*, "his." The patronymics are formed by putting the name of the city, country, &c. after the pronoun: *chou* is the pronoun relative *who, what, which*.

Chineſe verbs have only three tenſes, the preterperfect, the preſent, and the future. When there is no particle added to the verb, it is the preſent: the preterperfect is made by adding the particle *leao*: to diſtinguiſh the future tenſe they uſe the particle *tſiang* or *hoei*; and theſe are all the varieties incident to their verbs.

The Chineſe language has no words that are properly adverbs; they only become ſo by cuſtom, or by the place they poſſeſs in diſcourſe. They are often obliged to employ ſeveral words to expreſs the adverbs of other languages: they have none that are demonſtrative, or proper for calling or exhorting; but in their ſtead they are obliged to uſe nouns and verbs. 121

Perhaps our readers may wiſh to know the Chineſe numerals; and may imagine that they bear a reſemblance to thoſe of the European or other Aſiatic dialects. In this, however, they will be diſappointed. Their numerals.

They ſtand as follows:

Y	One
Eut	Two
San	Three
Sace	Four
Ou	Five
Lou	Six
Tſi	Seven
Po	Eight
Kieou	Nine
Che	Ten
Che y	Eleven
Eut che	Twelve
San che	Thirteen
Pe	One hundred
Eut pe	Two hundred
Y tſien	One thouſand
Y ouan	Ten thouſand
Che ouan	Twenty thouſand
Eut ouan	One hundred thouſand
Che ouan	Two hundred thouſand
Y pe ouan	One million

There are a great many particles proper to numbers in the Chineſe language: they are frequently uſed, and in a way peculiar to it; for every numeral has a particle importing the object to which it is attached. Thus *co* is uſed for man, and *y co* for a woman, &c.; *hoei* is uſed for illuſtrious men; *tche* or *tchi* is uſed for ſhips, dogs, hens; *mey* is uſed for pearls and precious things; *pen* is uſed for books; *teng* is appropriated to oxen and cows; *too* is uſed for letters and little bundles of paper; *oo* is employed for corn and pulſe. Thoſe diſtinctions indicate a language manufactured on purpoſe to be employed

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ployed by people who were too high and too haughty to converse with the vulgar.

122 Style of the Chinese writers.

The style of the Chinese, in their elaborate compositions, is mysterious, concise, and allegorical, after the eastern manner. It is often obscure to those who do not understand the language thoroughly; and it requires a considerable degree of skill to avoid mistakes in reading an author of elegance and sublimity. Their writers express a great deal in few words; and their expressions are lively, full of spirit, intermingled with bold comparisons and lofty metaphors. They affect to insert in their compositions many sentences borrowed from their five canonical books; and as they compare their books to pictures, so they liken these quotations to the five principal colours employed in painting; and in this their eloquence chiefly consists.

They prefer a beautiful character to the most finished picture; and nothing is more common than to see a single page covered with old characters, if they happen to be fair and elegant, sold at a very high price. They honour their characters in the most common books; and when they happen to light by chance upon a printed leaf, they gather it up with the greatest care and respect.

In China there are three varieties of language; that of the common people, that of the people of fashion, and that employed in writing books. Though the first is not so elegant as either of the other two, it is not however inferior to our European languages; though those who are but superficially acquainted with the Chinese may, in fact, imagine it uncouth and barbarous. This low and rude language is pronounced and written many different ways, as is generally the case in other countries.

But a more polished, and at the same time a much more energetic, language, is employed in an almost infinite number of novels; some perhaps true, but many more the vehicles of fiction. These are replete with lively descriptions, characters highly finished, morality, variety, wit, and vivacity, in such a degree as to equal in purity and politeness the most celebrated authors of Europe. This was the language of the Mandarins; and though exquisitely beautiful in its kind, was still inferior to the language of books. This last might be styled the *hypersublime;* and of this there are several degrees and intervals before an author can arrive at what they call the language of the *king*. This mode of writing cannot be well understood without looking upon the letters; but when understood, it appears easy and flowing. Each thought is generally expressed in four or six characters: nothing occurs that can offend the nicest ear; and the variety of the accents with which it is pronounced produces a soft and harmonious sound.

The difference between the *king* and their other books consists in the difference of the subjects upon which they are written. Those of the former are always grand and sublime, and of course the style is noble and elevated: those of the latter approach nearer to the common affairs and events of life, and are of consequence detailed in the Mandarin tongue. In writing on sublime subjects no punctuations are used. As these compositions are intended for the learned only, the author leaves to the reader to determine where the sense is complete; and those who are well skilled in the language readily find it out.

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The copiousness of the Chinese language is in a great measure owing to the multitude of its characters. It is likewise occasioned, in some degree, by the difference of their signification, as also by the artificial method of their conjunction, which is performed most commonly by uniting them two and two, frequently three and three, and sometimes four and four.

123 Their books numerous and bulky.

Their books are very numerous and bulky, and of course exceedingly cumbrous. A dictionary of their language was compiled in the 18th century. It consisted of 95 large volumes. An appendix was annexed of 25 volumes. Their other books are voluminous in proportion. The Chinese, one may say, are a nation of learned men. Few people of rank neglect the belles lettres; for ignorance in a man of any degree of eminence is deemed an indelible stain on his character.

For their manner of writing, the implements with which they write, and the materials upon which they draw their characters, we must refer our readers to the article WRITING. It would, we believe, afford our readers some pleasure, could we discover and explain the reasons which have hitherto prevented the Chinese from adopting the letters employed from time immemorial by the other nations of Europe and Asia.

124 Obstacles to their improvement in science and literature.

The Chinese have ever looked upon themselves as greatly superior to the rest of mankind. In ancient times they entertained such contemptible notions of foreigners, that they scorned to have any further commerce with them than to receive their homage. They were indeed, at a very early period, highly revered by the Indians, Persians, and Tartars. In consequence of this veneration, they looked upon themselves as the favourites of heaven. They imagined they were situated in the middle of the earth, in a kind of paradise, in order to give laws to the rest of mankind. Other men they looked upon with contempt and disdain, and deemed them deformed in body and defective in mind, cast out into the remote corners of the world as the dross and refuse of nature. They boasted that themselves only had received from God rational souls and beautiful bodies, in order to qualify them for being sovereigns of the species.

Such are the sentiments of the Chinese; and with such sentiments it is by no means surprising that their improvements in *language*, in *writing*, and other appendages of the belles lettres, have not been proportioned to their progress in mechanics. When people are once fully persuaded that they have already arrived at the summit of perfection, it is natural for them to sit down contented, and solace themselves with the idea of their own superior attainments. The Chinese had early entertained an exalted opinion of their own superiority to the rest of mankind; and therefore imagined that they had already carried their inventions to the *ne plus ultra* of perfection; the consequence was, that they could make no exertions to carry them higher.

The Chinese, for the space of 3000 years, had almost no intercourse with the rest of mankind. This was the consequence of their insulated situation.—They of course, *compared themselves with themselves;* and finding that they excelled all their barbarian neighbours,

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hours, they readily entertained an opinion that they excelled all the rest of mankind in an equal proportion. This conceit at once stifled the emotions of ambition, and deprived them of all opportunities of learning what was going forward in other parts of the world.

They despised every other nation. People are little disposed to imitate those whom they despise; and this perhaps may be one reason why they are at this day so averse from adopting the European inventions.

A superstitious attachment to the customs of the ancients, is the general character of the Asiatic nations. This is evidently a kind of diacritical feature among the Chinese. The institutions of *Fohi* are looked up to among them with equal veneration as those of *Thoth* were among the Egyptians. Among the latter, there was a law which made it capital to introduce any innovation into the music, painting, or statuary art, instituted by that legislator. We hear of no such law among the former; but custom established, and that invariably, for a space of 3000 years, might operate as forcibly among them as a positive law did among the people first mentioned. An attachment to ancient customs is often more powerful and more coercive than any law that can be promulgated and enforced by mere human authority. These reasons, we think, may be assigned as the impediments to the progress of the Chinese in the belles lettres, and perhaps in the cultivation of the other sciences.

125 Chinese words found in various other languages.

Though the language of the Chinese is confessedly different from all the other known languages in its character and construction, it contains, however, a great number of words evidently of the same origin with those which occur in other dialects, used by people, who, according to the natural course of things, could never have been connected with that remote country. A few of those we shall produce before we conclude this section. We shall begin with the import of the name *China*.

China, or, as the orientals write it, *Sin*, is perhaps the Latin *sinus*, "the bosom, the heart, the middle." The Chinese actually imagine that their country is situated in the very middle of the earth, and of consequence call it *Cham*, "the middle, the heart;" a denomination which exactly suits their opinion.

Tu, in Chinese, intimates every thing that falls under the cognizance of the senses, every thing that strikes the sight; in Latin, *tueor*.

Ta, a table, a plank, a figure that renders every thing sensible: 2. To see, to look upon, to appear; Greek τει τεινω, whence τεινω, *tendo*.

Tue, to examine attentively, to inspect carefully.

Tui, the most apparent, chief, principal, first; 2. Lightning, thunder.

Teu, a sign by which we know one, letter of acknowledgment. All these ideas are contained in the Hebrew תו, *thu*, *signum*, which we believe has produced the Egyptian *theuth*, the god or godlike man who invented letters, geometry, music, astronomy, &c.

Tai, a dye, a theatre; Greek of old Θεαω, then Θεαομαι, "to see, to look."

Tam, Latin *tantum*, "so much."

Tan, land, country, region, a syllable annexed to the end of a great number of words. *Aqui tan*, *Aquitania*, "a land of water;" *Mauri tan*, *Mauritania*, "the land of the Moors." The orientals prefix *s*, whence *Farsi stan*, *Farsistan*, "the land or country of the Persians:" *Chusi stan*, *Chusistan*, "the country of Chuz;" *Turque stan*, *Turquestan*, "the land of the Turks."

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Ti, a chief, an emperor, a title of dignity; whence the Greek τιω, "to honour;" hence, too, the word *di*, "bright, glorious," whence Δις, "Jupiter," "Διος, divine;" the Latin *Dius*, now *Deus*, "God," and *Divus*, with the *digamma Æolicum* inserted; the Celtic *Dhiu*, &c. It signified originally "bright, glorious," and was an epithet of the Sun.

Tum, Latin *tumeo*, "to swell."

Liven, "to love;" Hebrew לב, *leb*, "the heart;" Latin, *libet*. This word pervades all the dialects of the Gothic tongue, still retaining either the same or a nearly analogous signification.

Li, "letters;" Latin, *lino*, "to daub," as the Chinese actually do in forming their letters.

Lo, "to contain, that which contains;" Celtic, *log*; French, *loge*, *logis*, *loger*.

Lim, "a rule;" hence Latin, *linea*, "a line."

Su, "with;" Greek, συν, "with;" Celtic, *cyn*, *cym*; whence Latin, *cum*, *con*, &c.

Xim, "very high, elevated, sacred, perfect;" Latin, *eximius*.

Sin, "the heart;" Persian, *Sin*, "the heart."

Sien, "chief, first;" Celtic, *can*, *cean*, *san*, "the head;" metaphorically, the chief, the first, the principal; Thibet, *sen*, or *ken*, "great, elevated;" Arabic, *same*, "to be elevated or raised."

Sim, or *Sing*, "a constellation, a star, an element;" Hebrew, *shem*: Greek, σημειον, σημα; Latin, *signum*.

Sic, "a man of learning;" Goth. Sax. Engl. "see; to see, seer."

Cem, "a priest:" Hebr. *cohen*; Syr. *con*; Egypt. *con*, *cun*.

Quin, "a king;" Celtic, *ken*, *kend*, "head, chief;" Gothic, *koanig*; Germ. Flem. Engl. *king*, also *queen*.

Hu, "a door;" Goth. Germ. Engl. *hus*, *hausen*, *house*.

Min, "a river;" Welch, *men*, "the water of a river;" Latin, *mano*, "to flow," and perhaps *amoenus*, "pleasant."

Hen, "hatred;" Greek, αινος, "cruel, horrible, odious."

Kiven, "a dog;" Greek κυων, *id.*

Ven, "beauty;" Latin, *Venus*, *venustas*; Iceland. Swed. *wen*, "pleasant;" Scotch, *winsome*.

Han, "the soul, breath;" Greek, ανεμος; Latin, *anima*, *animus*.

To these instances of the analogy between the Chinese language and those of the other people of Asia and Europe many more might be added; but the preceding, it is hoped, will serve as a specimen, which is all that can be expected from an inquiry of the nature of the present.

Sect. VII. *Of the Greek Language.*

Before we enter upon the consideration of the essential and constituent parts of this noble language, we must beg leave to settle a few preliminaries, which, we 126 Origin of the Greeks.

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trust, will serve to throw some light upon many points which may come under consideration in the course of the following disquisition.

The Greeks, according to the most authentic accounts, were descended of Javan or Ion, the fourth son of Japhet, the eldest son of the patriarch Noah. The Scriptures of old, and all the orientals to this day, call the Greeks *Jonim*, or *Jaunam*, or *Javenoth*. We have already observed, in the beginning of the article concerning the Hebrew language, that only a few of the descendants of Ham, and the most profligate of the posterity of Shem and Japhet, were concerned in building the tower of Babel. We shall not now resume the arguments then collected in support of that position; but proceed to investigate the character of that branch of the posterity of Javan which inhabited Greece and the neighbouring regions.

At what period the colonists arrived in these parts cannot be certainly determined; nor is it of great importance in the question before us. That they carried along with them into their new settlements the language of Noah and his family, is, we think, a point that cannot be controverted. We have endeavoured to prove that the Hebrew, or at least one or other of its sister-dialects, was the primæval language of mankind. The Hebrew, then, or one of its cognate branches, was the original dialect of the Jonim or Greeks.

Be that as it may, before these people make their appearance in profane history, their language deviates very widely from this original archetype. By what means, at what period, and in what length of time this change was introduced, is, we believe, a matter not easy to be elucidated. That it was progressive, is abundantly certain both from the rules of analogy and reason.

The colonies, which traversed a large tract of country before they arrived at their destined settlements, must have struggled with numberless difficulties in the course of their peregrinations. The earth, during the period which immediately succeeded the universal deluge, must have been covered with forests, intersected with swamps, lakes, rivers, and numberless other impediments. As the necessaries, and a few of the conveniences of life, will always engross the first cares of mankind, the procuring of these comforts will, of necessity, exclude all concern about arts and sciences which are unconnected with these pursuits. Hence we think it probable, that most of those colonies which migrated to a very great distance from the plains of Shinar, which we believe to have been the original seat of mankind, in a great measure neglected the practice of the polite but unnecessary modes of civilization which their ancestors were acquainted with, and practised before the era of their migration. Certain it is, that those nations which continued to reside in the neighbourhood of that centre of civilization, always appear in a cultivated state; while, at the same time, the
127 colonists who removed to a considerable distance appear to have sunk into barbarism, at a period more early than the annals of profane history can reach.—This appears to have been the situation of the primary inhabitants of Greece. Their own historians, the most partial to their own countrymen that can well be imagined, exhibit a very unpromising picture of their earliest progenitors. Diodorus Siculus, in delineating the character of the original men, we believe sketches his draught from the first inhabitants of Greece *. He represents them as absolute savages, going out in small parties to make war upon the wild beasts of the field, which (according to him) kept them in continual alarm. "Necessity obliged them to band together for their mutual security; they had not sagacity enough to distinguish between the wholesome and poisonous vegetables; nor had they skill enough to lay up and preserve the fruits of autumn for their subsistence during the winter." The scholiast on Pindar describes the situation of the inhabitants of Peloponnesus in the following manner †. "Now some have affirmed that the nymphs, who officiated in performing the sacred rites, were called *Melissæ*. Of these Mnaseas of Patara gives the following account. They prevailed upon men to relinquish the abominable practice of eating raw flesh torn from living animals, and persuaded them to use the fruits of trees for food.— 128
Melissa, one of them, having discovered bee-hives, ate of the honey-combs, mingled the honey with water for drink, and taught the other nymphs to use the same beverage. She called bees Μελισσας, *Melissæ*, from her own name, and bestowed much care on the management of them.

Who were long a barbarous people.

* Lib i.

† *Pythol.* Ode 4.

Progress of their civilization.

"These things (says he) happened in Peloponnesus; nor is the temple of Ceres honoured without nymphs, because they first pointed out the mode of living on the fruits of the earth, and put an end to the barbarous practice of feeding on human flesh. The same ladies, too, from a sense of decency, invented garments made of the bark of trees."

Hecatæus the Milesian, treating of the Peloponnesians, affirms *, "that before the arrival of the Hellenes, a race of barbarians inhabited that region; and that almost all Greece was, in ancient times, inhabited by barbarians †. In the earliest times (says Pausanias) (o) barbarians inhabited most part of the country called *Hellas*." The original Greeks, if we may believe an author of deep research and superior ingenuity ‡, were strangers to all the most useful inventions of life. Even the use of fire was unknown till it was found out and communicated by Prometheus, who is thought to have been one of the first civilizers of mankind. Hence Æschylus §, introduces Prometheus commemorating the benefits which he had conferred upon mankind by his inventions, in a strain that indicates the uncultivated state of the world prior to the age in which he flourished. For the entertainment of our readers, we shall translate as much of that passage as suits our present purpose.

* *Strabo*, lib. vii.

† *Id.* lib. i.

‡ *Plin. Nat. Hist.*

§ *Prometh.* verse 441.

————" Of the human race
Now hear the tale, how foolish erst they were:
I taught them thought and exercise of reason;
If aught they saw before, they saw in vain.
Hearing, they heard not; all was shapeless dreams
For a long space of time, at random mixt.

In

(o) The Greeks borrowed this contemptuous epithet from the Egyptians. See *Herod.* lib. ii. cap. 158.

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In wild confusion: for they neither knew
Tile-cover'd houses standing in the sun,
Nor timber work; but, like the earth-bred ant,
They lodg'd in sunless caves dug under ground:
No certain sign had they of winter cold,
Nor of the flow'ry spring, or summer store,
But blindly manag'd all; till I them taught
What time the stars appear, what time they set,
Hard to be scan'd: then arithmetic rare,
That queen of arts, by dint of patient thought
Descry'd, I taught them; and how vocal sounds
From letters join'd arose."

This character, though applied to mankind in general, was in reality that of the most ancient Greeks. These forbidding features had been transmitted to the poet by tradition as those of his ancestors: he was a Greek, and of consequence imputes them to all mankind without distinction.

Phoroneus, the son and successor of Inachus*, is said to have civilized the Argives, and to have taught them the use of some new inventions. This circumstance raised his character so high among the savage aborigines of the country, that succeeding ages † deemed him the first of men. Pelasgus obtained the like character, because he taught the Arcadians to live upon the fruit of the *fagus*, to build sheds to shelter them from the cold, and to make garments of the skins of swine.

* *Plato.*

† *Pausan.* lib. viii. c. 1.

But what clearly demonstrates the unpolished character of the most ancient Greeks is, the extravagant honours lavished by them upon the inventors of useful and ingenious arts. Most of these were advanced to divine honours, and became the objects of religious worship to succeeding generations. The family of the Titans affords a most striking instance of this species of adulation. Jupiter, Juno, Mars, Apollo, Venus, Diana, &c. were sprung of this family. By the useful inventions which these personages communicated to the uncultivated nations of Greece, they obtained such lasting and such extravagant honours, that they justled out the sidereal divinities of the country, and possessed their high rank as long as Paganism prevailed in those regions. To these testimonies of the savagism of the original Greeks, others almost without number might be added; but those adduced in the preceding part of this inquiry will, we hope, satisfy every candid reader as to the truth of the position advanced.

129
A new colony arrives in Greece called *Pelasgi*.

While matters were in this situation with respect to the primitive Jonim or Greeks, a new colony arrived in those parts, which in a few years considerably changed the face of affairs. The people who composed this colony were called *Pelasgi;* concerning whose origin, country, character, and adventures, much has been written, and many different opinions exhibited by the learned. It is not our province to enter into a detail of their arguments and systems; we shall only inform our readers, that the general opinion is, that they were natives either of Egypt or Phœnicia. We have seen a dissertation in manuscript upon this subject, from which we are allowed to extract the following particulars.

The author, we think, has proved by very plausible arguments, that these people could not be descendants of the Egyptians nor Phœnicians. He maintains, that the Pelasgi were a great and numerous tribe; that they overspread all the coast of Asia Minor from Mount Mycale to Troas; that they were masters at one time of all the Asiatic and Grecian islands; that they overran Greece and many of the neighbouring countries; and all this in less than half a century.—These facts he seems to have proved from Homer, Herodotus, Diodorus Siculus, Pausanias, and other Greek authors of approved authenticity. He shows, that they were a civilized generation; that they were well acquainted with military affairs, legislation, agriculture, navigation, architecture, letters, &c. He insists, that Phœnicia could not at any given period have furnished such a numerous body of emigrants, even supposing the whole nation had emigrated, and left their native country a desert. He believes that this event took place before the invasion of Canaan by the Israelites; that consequently the Pelasgic migration was not occasioned by that catastrophe. He has shown, we think by very probable arguments, that the Egyptians in the earliest ages were averse to foreign expeditions, especially by sea; because that people hated this element, and besides could be under no temptation to emigrate: add to this, they were accustomed to live on small matters, and their country was exceedingly fertile and easily cultivated. It appears (says he) from Herodotus, that the Pelasgi were not acquainted with the religion of the Zabians, which could not have been the case had they emigrated from either of these countries. He makes it appear, at least to our satisfaction, that Herodotus is mistaken when he supposes that the deities of Greece were derived from Egypt. He demonstrates, that the names of the greatest part of those deities are of Phœnician extraction; and this opinion he establishes by a very plausible etymological deduction. He asserts, that had the Pelasgi been natives of either of the countries above mentioned, it would be absurd to suppose them ignorant of the names and religious rites of their respective nations. He finds, that the Egyptian and Phœnician colonies, which afterwards settled in Greece, were enemies to the Pelasgi, and either subdued or expelled them the country, which, he imagines, would scarce have been the case had both parties sprung from the same ancestors. After settling these points, he concludes, that the people in question were the progeny of the Arabian shepherds, who, at a very early period, invaded and subdued both the Lower and Upper Egypt. After possessing that country about a century and a half, they were conquered by Amenophis king of the Upper Egypt, who drove them out of the country. Upon this the fugitives retired to Palestine, where Manetho the Egyptian historian loses sight of them, and either through malice or ignorance confounds them with the Israelites. This writer supposes that those fugitives gradually directed their course for the west and north-west coasts of Asia Minor, whence they conveyed themselves over to Greece.

Such are the arguments by which the author of the dissertation above mentioned supports his hypothesis. It is, for aught we know, altogether new, and to us it appears by no means improbable. If our curious readers should wish to know more of this subject, they may consult Gebelin's preliminary Discourse to his Greek Dictionary, Lord Monboddo's Inquiry into the Origin and Progress of Language, vol. i. towards the end, and Mr Bryant's Analysis of Ancient Mythology, *passim*.

Be this as it may, nothing is more certain than that the Pelasgi were the first people who in some degree civilized the savages of ancient Greece. It is not our

Greek Language.

130 Who introduce letters into that country.

business at present to enumerate the many useful inventions which they communicated to the Greeks, at that time worse than barbarians. We deem it, however, absolutely necessary, as an introduction to our subject, to hazard a few conjectures on the language and letters of those adventurers; a point strictly connected with the subject soon to fall under consideration.

Whether we suppose the Pelasgi to have been the offspring of the Phœnicians, Egyptians, or Arabian shepherds, it will make little difference as to their language; every man of learning and research is convinced that those three nations, especially at that early period, spoke a dialect of the Hebrew. The Pelasgi, then, must have spoken a dialect of that language when they arrived in Greece. Perhaps it might have undergone several changes, and acquired some new modifications, during so many years as had passed since they began to be a separate nation, and in the course of so many peregrinations. Some monuments of theirs still extant prove this fact beyond all contradiction. As these people incorporated with the aborigines of Greece, the remains of the original language of mankind, or at least so much of it as had been retained by them, gradually coalesced with that of the new settlers. From this, we think, it is obvious, that prior to the arrival of the new colonists from the East, the language now current among the two united tribes must have been a dialect of the Phœnician, Arabian, Hebrew, &c. Be that as it may, Herodotus * affirms that the Pelasgi in his time spoke a barbarous language, quite unintelligible to the modern Greeks.

* Lib. i. cap. 59.

The reason of this difference between the language of the Hellenes or Greeks in the age of Herodotus, and that of the remains of the Pelasgi at that period, seems to be this: Prior to the time of that historian, the Greek language had, from time to time, undergone many changes, and received vast improvements; whereas, on the contrary, that of the remnant of the Pelasgi, who were now reduced to a very low state, had remained stationary, and was then just in the same predicament in which it had been perhaps a century after their arrival in the country.

As the Pelasgi, as was observed above, were a people highly civilized and well instructed in the various arts at that time known in the eastern world, they were skilled in agriculture, architecture, music, &c. (P). The presumption then is that they could not be unacquainted with alphabetical writing. This most useful art was well known in the countries from which they emigrated; and of course it is impossible to imagine that they did not export this art as well as the others above-mentioned. Diodorus Siculus imagines that † the Pelasgi knew not the use of alphabetical letters, but that they received them from Cadmus and his Phœnician followers; that those letters were afterwards called *Pelasgic*, because the Pelasgi were the first people of Greece who adopted them. This account must go to the score of national vanity, since very soon after he acknowledges * that Linus wrote the exploits of the first Bacchus and several other romantic fables in Pelasgic characters; and that Orpheus, and Pronapides the master of Homer, employed the same kind of letters. Zenobius likewise informs us † that Cadmus slew Linus for teaching characters different from his. These letters could be none other than the Pelasgic ‡.

† Lib. iii.

* Ibid.

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† *Apud Dr Gregory Sharp's Strict. Greek Language.*

‡ See Plate XVI.

Pausanias, in his Attics, relates ‖, that he himself saw an inscription upon the tomb of Corœbus, who lived at the time when Crotopus, who was contemporary with Deucalion, was king of the Argives. This inscription then was prior to the arrival of Cadmus; and consequently letters were known in Greece before they were introduced by this chief. It likewise appears from Herodotus himself, that the Ionians were in possession of alphabetical characters before the coming of the Phœnicians. "For (says he) § the Ionians having received letters from the Phœnicians, changing the figure and sound of some of them, ranged them with their own, and in this manner continued to use them afterwards." If, then, the Ionians (Q) ranged the Phœnician characters with their own, it is obvious that they had alphabetical characters of their own.

‖ Lib. i. cap. 49.

§ Lib. i. c. 58.

Besides these historical proofs of the existence of Pelasgic characters, monuments bearing inscriptions in the same letters have been discovered in several parts of Greece and Italy, which place this point beyond the reach of controversy. What characters these were may be easily determined. As the Pelasgi emigrated from Arabia, the presumption is that their letters were Phœnician. They are said by Dr Swinton to have been 13 in number, whereas the Phœnician alphabet consists of 16. The three additional letters were probably invented by the latter people after the Pelasgi had left the eastern quarters. The Phœnician letters imported by the Pelasgi were, no doubt, of a coarse and clumsy contexture, unfavourable to expedition in writing, and unpleasant to the sight. Besides, the Phœnician characters had not as yet received their names; and accordingly the Romans, who derived their letters from the Arcadian Pelasgi *, had no names for theirs. The probability is, that prior to this era the Pelasgic letters had not been distinguished by names. These were of course no other than the original letters of the Phœnicians in their first uncouth and irregular form: and for this reason they easily gave way to the Cadmean, which were more beautiful, more regular, and better adapted to expedition.

* *Livii*, lib. i. c. 7.

Plate XV.

Hitherto we have seen the Pelasgi and the Ionim incorporated, living under the same laws, speaking the same language, and using the same letters. But another nation, and one too of vast extent and populousness, had at an early period taken possession of a considerable part of the country afterwards distinguished by the name of *Hellas* or *Greece*. The Thracians were a great and mighty nation; inferior to none except the Indians †, says the father of Grecian history. These people at a very early period, had extended their quarters over all the northern parts of that country. They were, in ancient times, a learned and polished nation. From them,

† *Herod.* lib. v. c. 3.

131 The Thracians a powerful nation at a very early period.

(P) The Arcadians, who were a Pelasgic tribe, were highly celebrated for their skill in music. They introduced this art into Italy. See *Dion. Halicar.* lib. i.

(Q) The Athenians were originally called *Ionians*.

Greek Language.

in ſucceeding ages, the Greeks learned many uſeful and ornamental ſciences. Orpheus (R) the muſician, the legiſlator, the poet, the philoſopher, and the divine, is known to have been of Thracian extraction. Thamyris and Linus were his diſciples, and highly reſpected among the Greeks for their learning and ingenuity. That theſe people ſpoke the ſame language with the Greeks, is abundantly evident from the connection between them and theſe Thracian bards. The Thracian language, then, whatever it was, contributed in a great proportion towards forming that of the Greeks. From the remains of the Thracian dialect there appears to have been a very ſtrong reſemblance between it and the Chaldean. This poſition we could readily ſupport by the moſt plauſible etymological deduction, did the limits preſcribed us in this article admit ſuch an inquiry. It appears, however, that the * Thracians, Getæ, and Daci or Davi, ſpoke nearly the ſame language. The Goths, ſo much celebrated in the annals of the lower empire, were the deſcendants of the Getæ and Daci, and conſequently retained the dialect of their anceſtors. The reader, therefore, muſt not be ſurpriſed, if in tracing the materials of which the Greek language is compoſed, we ſhould ſometimes have recourſe to the remains of the Gothic.

* Strabo, lib. i. & vii.

131 The Greek language compoſed of three different dialects.

We have now found out three branches of the Greek language; that of the Ionim or *Aborigines*, that of the Pelaſgic tribe, and that of the Thracians. Theſe three, we imagine, were only different dialects of the very ſame original tongue. This aſſertion we could readily prove by the compariſon of a great number of words taken from the two laſt, were this a proper place for ſuch a diſcuſſion.

132 Arrival of Cadmus in Greece.

Some centuries after the arrival of the Pelaſgi, Cadmus, an Egyptian (S) by birth, and a ſojourner in Phœnicia, arrived in Bœotia with a multitude of followers. This colony-chief and his countrymen introduced letters and ſeveral other uſeful improvements into the country in queſtion. As theſe people were natives of Phœnicia and its environs, their alphabet was that of their native country, conſiſting of 16 letters. That the Phœnician alphabet was nearly the ſame with the Samaritan and Hebrew, has been ſo often and ſo clearly demonſtrated by the learned of this and the former century, that it would be altogether ſuperfluous to inſiſt upon it in this ſhort inquiry. The Phœnicians, as is generally known, wrote from right to left, and the old Grecian characters, inverted, exactly reſemble the other.

† Scaliger.

The names of the Cadmean characters are Syrian †, which ſhows the near reſemblance between that language and the Phœnician. They ſtand thus: *alpha, beta, gamla, delta*, &c. The Syrians uſed to add *a* to the Hebrew vocables; hence alph becomes alpha, beth, betha or beta, &c. In the Cadmean alphabet we find the vowel letters, which is an infallible proof that this was the practice of the Phœnicians in the age of Cadmus; and this very circumſtance furniſhes a preſumption that the Jews did the ſame at the ſame period.

133 The letters introduced by him.

After all, it is evident that the oldeſt Greek letters, which are written from right to left, differ very little from thoſe of the Pelaſgi. The four double letters θ, φ, ξ, χ, are ſaid to have been added by Palamedes about 20 years before the war of Troy. Simonides is generally ſuppoſed to have added the letters ζ, η, ψ, though it appears by ſome ancient inſcriptions that ſome of theſe letters were uſed before the days of Palamedes and Simonides.

In the year of our Lord 1456 ſeven brazen tables were diſcovered at Engubium, a city of Umbria in the Apennines, of which five were written in Pelaſgic or Etruſcan characters and two in Latin. The firſt of theſe tables is thought to have been compoſed about 168 years after the taking of Troy, or 1206 years before Chriſt. By comparing the inſcription on theſe tables with the old Ionic characters, the curious have been enabled to diſcover the reſemblance.

134 The old Ionic character.

The old Ionic character wrote from right to left continued in general uſe for ſeveral centuries: It was compoſed of the Cadmean and Pelaſgic characters, with ſome variations of form, poſition, and ſound. The Athenians continued to uſe this character till the year of Rome 350. The old Ionic was gradually improved into the new, and this quickly became the reigning mode. After the old Ionic was laid aſide, the * (Βουστροφηδον) Buſtrophodon came into cuſtom, which goes backwards and forwards as the ox does with the plough. They carried the line forward from the left, and then back to the right. The words were all placed cloſe together, and few ſmall letters were uſed before the fourth century. If our curious readers would wiſh to know more of letters and alphabets, we muſt remit them to Chiſhul, Morton, Poſtellus, the great Montfaucon, Gebelin, Aſtle, &c. For our part we are chiefly concerned at preſent with the Phœnician and Cadmean ſyſtems; and on theſe perhaps we may have dwelt too long. Having now, we hope, ſufficiently proved that the Greek alphabet was derived from the Phœnician, in order to convince our curious but illiterate readers of the certainty of our poſition, as it were by ocular demonſtration, we ſhall annex a ſcheme of both alphabets, to which we ſhall ſubjoin ſome ſtrictures upon ſuch letters of the Greek alphabet as admit any ambiguity in their nature and application.

* Pauſan. lib. viii. cap. 17.

135 The Greek alphabet derived from the Phœnician.

A, *alpha*, had two ſounds, the one broad like *a* in the Engliſh word *all*; the other ſlender, as *e* in *end, ſpend, defend*. The Hebrews certainly uſed it ſo, becauſe they had no other letter to expreſs that ſound; the Arabs actually call the firſt letter of their alphabet *elif*; and they as well as the Phœnicians employ that letter to expreſs both the ſound of A and E promiſcuouſly. The Greeks call their letter E ε ψιλον, that is E ſlender, which ſeems to have been introduced to ſupply the place of A ſlender.

H, *eta*, was originally the mark of the *ſpiritus aſper*, and no doubt anſwered to the Hebrew ה. It is ſtill retained in that capacity in the word Ηεκατον, and in words with the *ſpiritus aſper* beginning books, chapters, ſections,

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(R) Orpheus ſeems to be compounded of two oriental words, *or*, "light," and *phi*, "the mouth." Though ſome deduce it from the Arabian *arif*, a learned man."

(S) Joſeph Scaliger's account of the origin of the Ionic letters. *Euſeb. Chron.*

tions, &c. Ε originally marked both the ſound of Εψιλον and Ητα; that is, it was ſometimes ſounded ſhort as at preſent, and ſometimes long, where it is now ſupplied by Η. As it was found convenient to diſtinguiſh theſe two different quantities of ſound by different letters, they adopted Η, the former *ſpiritus aſper*, to denote the long ſound of Ε, and ſubſtituted the preſent *ſpiritus aſper* [῾] in its place.

Ι, *iota*, is the Hebrew or Phœnician *jod* or *yod*. We imagine it originally ſerved the purpoſe of both iota and ypſilon. It had two different ſounds; the one broad and full, the other weak and ſlender. The latter had the ſound of the modern υψιλον. That this was actually the caſe, appears in ſeveral monumental inſcriptions: And upon this depends the variation of ſome caſes of the demonſtrative pronoun and of the ſecond declenſion.

Ο, *omicron*, or ſmall *o*, in the original Greek had three different ſounds. It ſounded *ο* ſhort, as at preſent; and likewiſe *ο* long, now denoted by Ω or large *O*. It likewiſe marked the ſound of the improper diphthong ου, ſounded like the Engliſh diphthong *oo*. The Ω was taken from the Phœnician wau or *V*.

Υ, *ypſilon*, we have obſerved before, was adopted to ſupply a mark for the ſound of Ι ſlender.

Ζ, *zeta*, is compounded of δς. Dion. Halic. however, informs us, that this letter ſhould be pronounced σδ, according to the Doric plan.

Θ, *theta*, was not known in the old Greek. It is compounded of τ and the *ſpiritus aſper*, both which were of old written ſeparately thus ΤΗ.

Ξ, *xi*, is compounded of γς, κς, χς. Theſe letters, too, were originally written ſeparately.

Φ, *phi*. This letter is compounded of β, π, and the *ſpiritus aſper*; thus ΒΗ, ΠΗ.

Χ, *chi*, like the foregoing, is compounded of γ, κ, and the *ſpiritus aſper* as above.

Ψ, *pſi*, like ſome of the reſt, is made up of βς, πς, which, too, were originally written in ſeparate characters.

Theſe obſervations are thrown together purely for the uſe of ſtudents who may not chooſe to inquire into the *minutiæ*. We are ſorry that the nature of the work will not permit us to extend our reſearches to greater length. The reader will find an ancient inſcription on Plate CCCCXVI. in which the powers of the letters are exemplified as they were in the firſt ſtage of the Greek language. Every language, we believe, was originally compoſed of inflexible words; the variations which now diſtinguiſh nouns and verbs were the effects of progreſſive improvements. What might have been the ſtate of the Greek language with reſpect to theſe variations in its original form, it is not now poſſible to diſcover. That it was rude and irregular, will not, we imagine, be controverted. One of the firſt attempts towards forming the variations, now denominated *declenſions* and *conjugations*, would probably be made upon the *demonſtrative* article and the *ſubſtantive* verb. This obſervation will be found to hold good in moſt poliſhed languages. In the Greek tongue, this was evidently the method.

136 Origin and flexion of the article.

The original Greek article was imported from the eaſt. It was the Hebrew or Phœnician ה *ha*. This particle ſometimes ſignifies *one*, and ſometimes it anſwers to our demonſtrative *the*; both in its adverbial and demonſtrative capacity it imports demonſtration. In the earlieſt ſtages of the two oriental languages, it was probably written apart, as *ha-melech*, "the king." In proceſs of time it came to be joined with the following word, as *Hammelech*. From this we think the Greek article was deduced. It is ſtill retained in the Doric dialect in its priſtine character. The difference between *ho* and *ha* in the eaſtern language is nothing. Here then we have the articles ὁ maſculine and ἁ feminine. Upon theſe ſeveral changes were ſuperinduced, in order to render them more uſeful for the purpoſes of language. For thoſe changes we know of no archetype.

The Greeks then having adopted the Hebrew, or Phœnician, or Chaldean article *ha*, and changed it into *ho* for the maſculine, ſeem to have arranged its variations in the following manner:

	Sing.	Plu.
Nom.	ὁ	ὁι
Gen.	ὁυ	ὁν
Dat.	ὁι	ὁις
Acc.	ὁν	ὁυς

137 Its uſe in the flexion of nouns of the firſt and ſecond declenſions.

In the earlieſt ſtages of the Greek language, ι and υ were ſounded in the ſame manner, or nearly ſo, as was obſerved above. The accuſative was at firſt like the nominative; for diſtinction's ſake it was made to terminate in ν, which letter was likewiſe adopted to characterize the genitive plural; ς was annexed to the dative plural, to diſtinguiſh it from the dative ſingular. The radical word was ſtill without inflexion.

When the article was inflected in this manner, the proceſs ſtood as follows: we take λογος for an example.

	Sing.	Plu
Nom.	ὁ λογ *ſpeech*	ὁι λογ *ſpeeches*
Gen.	ὁυ λογ *of ſpeech*	ὁν λογ *of ſpeeches*
Dat.	ὁι λογ *to ſpeech*	ὁις λογ *to ſpeeches*
Acc.	ὁν λογ *ſpeech*	ὁυς λογ *ſpeeches*

In this arrangement our readers will obſerve, that in the time under conſideration, ω was not yet introduced; and therefore ομικρον or little ο was the ſame letter in the genitive plural as in the accuſative ſingular; but in the latter caſe it was ſounded long by way of diſtinction.

The article *ha*, which is ſtill retained in the Doric dialect, was varied as follows:

	Sing.	Plu.
Nom.	ἁ	ἁι
Gen.	ἁς	ἁν
Dat.	ἁι	ἁις
Acc.	ἁν	ἁς

Theſe variations differ a little from thoſe of the maſculine; and they were no doubt made for the ſake of diſtinction, as is uſual in ſuch caſes. We ſhall now give an example of the feminine as it muſt have ſtood before variations were introduced We ſhall employ τιμη.

	Sing.	Plu.
Nom.	ἁ τιμ *honour*	ἁι τιμ *honours*
Gen.	ἁς τιμ *of honour*	ἁν τιμ *of honours*
Dat.	ἁι τιμ *to honour*	ἁις τιμ *to honours*
Acc.	ἁν τιμ *honour*	ἁς τιμ *honours*

Afterwards,

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Afterwards, when the Chaldean article *da* was adopted for the neuter gender, the letter ד or *d* was changed into τ, and prefixed to it; and then the Greeks, who, in their declension of adjectives, always followed the neuter gender, began to prefix it to the oblique cases.

In this manner we think the Greek nouns stood originally; the only change being made upon the article. At length, instead of prefixing that word, and expressing it by itself, they found it convenient to affix a fragment of it to the noun, and so to pronounce both with more expedition. Thus ὁς-λογ, e. g. became λογ-ος, ὀυ λογ became λογ-ου, and of course λογος and λογου, &c. The *spiritus asper*, or rough breathing, was thrown away, in order to facilitate the coalition. Nouns of the neuter gender, as was necessary, were distinguished by using ν instead of ς. In Oriental words the Greeks often change ς into ν, and *vice versa*.

138 In this mode of flexion the Greeks copied from the Orientals.

In this case the Greeks seem to have copied from an eastern archetype. In Hebrew we find an arrangement exactly similar. To supply the place of the pronouns possessive, they affix fragments of the personals: Thus, they write *ben-i*, "my son," instead of *ben-ani*, and *debir-nu*, "our words," instead of *debir-anu*, &c. The persons of their verbs are formed in the same manner. In this way, in our opinion, the variations of the first and second declensions were produced.

139 Formation of the third declension, and of its cases.

After that a considerable number of their nouns were arranged under these two classes, there remained an almost infinite number of others which could not conveniently be brought into these arrangements; because their terminations did not readily coalesce with the articles above mentioned. These, like nouns of the neuter gender, were in a manner secluded from the society of the two other classifications. It is probable that these for a long time continued indeclinable. At last, however, an effort was made to reduce them into a class as well as the others. All these excluded nouns originally terminated with ς, which appears from their genitives as they stand at present. By observing this case, we are readily conducted to the termination of the pristine vocable. The genitive always ends in ος, which ending is formed by inserting ο between the radical word and ς. By throwing out ο we have the ancient nominative: Thus, Τιταν, genitive Τιτανος; taking out ο we have Τιτανς, the original inflexible termination. Αητω, genitive Αητοος; throw out ο and you have Αητος. Παλλας, genitive Παλλαδος; take away ο and there remains παλλαδς. Ορνις, genitive Ορνιθος; by throwing out ο we have Ορνιθς. Αναξ, genitive Ανακτος, Ανακτς. Κρατος, genitive Κρατεος, Κρατης; originally Κρατες, because originally ε had the sound of η, as was observed above. Μελι, genitive Μελιτος, Μελιτς. Ειδος, genitive Ειδεος, Ειδες, the old noun. In short, the genitive is always formed by inserting ο immediately before ς, which is always the termination of the nominative; and by this rule, we easily discover the noun such as it was in its original form.

The dative of this declension was closed with ι *ascriptum*; the same with that of the second, namely, ι *subscriptum*. The accusative commonly terminates with α; but was originally ended with ν. The Romans imitated the Æolian dialect, and they commonly ended it with *em* or *im*. The Greeks, perhaps in this imitated their progenitors, for *a* was their favourite vowel. The nominative plural ended in ες, which nearly resembles the English plural, and was possibly borrowed from the Thracians. The genitive plural in all the declensions ends in ων; the dative ends in σι, the σ being inserted to distinguish it from the dative singular. When a strong consonant, which would not easily coalesce with ς, comes immediately before it, that consonant is thrown out to avoid a harsh or difficult sound. The sum then is; the cases of nouns of the first and second declensions consist of the radical word with fragments of the articles annexed, and these were the first classifications of nouns. The other nouns were left out for some time, and might be denominated *neuters*; at length they too were classified, and their variations formed as above. In this process the Greeks deviated from the oriental plan; for these people always declined their nouns by particles prefixed. Whether the Greeks were gainers by this new process, we will not pretend positively to determine. We are, however, inclined to imagine that they lost as much in perspicuity as they gained by variety.

140 Greek ablative.

It is generally believed that the Greeks have no ablative; to this opinion, however, we cannot assent. It is true, that the dative, and what we would call the *ablative*, are always the same: yet we think there is no more reason to believe that the latter is wanting in Greek, than that the ablative plural is wanting in Latin, because in that language both these cases are always alike.

In the eastern languages there are only two genders, analogous to the established order of nature, where all animals are either male or female. But as the people of the east are, to this day, strongly addicted to personification, they ranged all objects of which they had occasion to speak, whether animate or inanimate, under one or other of these two classes. Hence arose what is now called the *masculine* and *feminine* genders. The orientals knew nothing of a neuter gender, because, indeed, all objects were comprehended under the foregoing classes. The Phœnician feminine was formed from the masculine, by adding אה, *ah*. In this the Greeks in many cases imitated them. The Greeks and Latins left a vast number of substantives, like a kind of outcasts, without reducing them to any gender; this process gave rise to the neuter gender, which imports, that such substantives were of *neither gender*. This has the appearance of a defect, or rather a blemish, in both. Sometimes, too, they make words neuter, which, according to the analogy of grammar, ought to be either masculine or feminine. And again, they range words under the masculine or feminine, which by the same rule ought to have been neuter. In short, the doctrine of generical distribution seems to have been very little regarded by the fabricators of both tongues. The beauty which arises from variety seems to have been their only object.

141 Genders.

142 Farther observations on the article.

The use of the article in the Greek language is, we think, rather indeterminate; it is often prefixed to proper names, where there is no need of demonstration nor generical distinction. On the contrary, it is often omitted in cases where both the one and the other seem to require its assistance. In short, in some cases it seems to be a mere expletive. Though both Lord Monboddo and Mr Harris have treated of this part of speech, neither the one nor the other has ascertained its proper use. (See *Origin and Progress of Language*, vol. ii. p. 53. *Hermes*, p. 214. *et seq.*)—We know not any objection to

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to the early use of articles among the Greeks so plausible as the total neglect of them among the Romans. But it ought to be considered, that after the flexions were introduced, the use of the article was in a great measure neglected. Accordingly, Lord Monboddo observes that it is very seldom used as such by Homer, but commonly in place of the relative pronoun ὃς, ἣ, ὃ.—Thus it would appear, that at the time when the Roman language was reduced to the Grecian standard, the article was not commonly used by the Greeks; and of course the Latins never employed it. There can be no doubt but the pronoun *who*, in the northern languages, is the same with the Greek ὁ, and the Hebrew *hua*. This among the northern people is always a relative, which affords a presumption that the Greeks originally used the article in the same manner as we do at present. The fact is, that the articles having once got into vogue, were often positively used as mere expletives to fill up a gap; and that, on the other hand, when there was no occasion for pointing out an object, it being fully determined by the tenor of the discourse, it was often omitted.

143 Adjectives.

In forming adjectives, they followed the same plan that they had done with substantives. Their great effort was to make their adjectives agree with their substantives in gender, number, and case. This arrangement improved the harmony of speech; and nothing could be more natural than to make the word expressing the quality correspond with the subject to which it belonged.

As adjectives denote qualities, and thus are susceptible of degrees, nature taught them to invent marks for expressing the difference of these degrees. The qualities may exceed or fall below each other by almost numberless proportions; it was, however, found convenient to restrict these increases and decreases to two denominations. The positive is, properly speaking, no degree of comparison at all; therefore we need only point out the formation of the comparative and superlative.

The former is generally thought to be fabricated, by first adding the Hebrew word יתר, *excellent*, to the positive, and then affixing the Greek termination ος; and the latter, by affixing the Syrian word *tath* and the syllable ος, in the same manner.

144 Greek numerals.

Every nation, even the most uncivilized, have early acquired the notion of number. Numerical characters and names are the same in many different languages. These terms were discovered, and in use, long before grammar came to any perfection; and therefore remain either inflexible or irregular. The first way of computing among the Greeks was by the letters of the alphabet; so that Α signified *one* and Ω *twenty-four*: in this manner the rhapsodies of Homer are numbered; and so are the divisions of some of the Psalms, as is generally known. But a more artificial plan of computation was obviously necessary. They divided the letters of the alphabet into *decades* or tens, from Α to Ι=10. To express the number 6, they inserted ϛ *baw*=6; so that by this means the first decade amounted to 10. In the next decade every letter increased by tens, and so Ρ denoted 100. In this decade they inserted ϙ κοππα=90. In the third, every letter rose by 100; so that ϡ σαμπι=900. By inserting these three Phœnician characters they made their alphabet amount to 900. To express chiliads or thousands, they began with the letters of the alphabet as before; and to make the distinction, they placed a dot under each character, as the units, tens, hundreds, were distinguished by an acute accent over them.

But in monumental inscriptions, and in public instruments, a larger and more lasting numerical character was fabricated. They began with Ι, and repeated that letter till they arrived at Π=5. This is the first letter of πεντε, *five*. Then they proceeded, by repeating Ι till they came to 10. Δ, the first letter of δεκα, 10. Then they repeated Δ over and over, so that four Δ=40. To express 50, they used this method; they inclosed Δ in the belly of |Δ|=50, |Η|=500, |Μ|=50,000, &c. Often, however, Χ signifies 1000, and then we have δις Χιλιοι, 2000; τρεις Χιλιοι, 3000; and so of the rest.

The word *pronoun* signifies a word placed instead of a noun or name; and indeed the personal pronouns are really such: this needs no explication. The pronoun of the first person is one of those words which have continued invariable in all languages; and the other personals are of the same character. The relatives, possessives, demonstratives, and gentiles, are generally derived from these, as may be discerned by a very moderate adept in the language. Our readers will therefore, we hope, easily dispense with our dwelling upon this part of speech. 145 Pronouns.

Verb. In most ancient languages, verbs, according to the order of nature, have only three tenses or times, namely, the *past*, *present*, and *future*. The intermediate tenses were the invention of more refined ages.—The Greek, in the most early periods, had no other tenses but those above mentioned. The manner of forming these we shall endeavour to point out, without touching upon the nature of the rest, since an idea of them may be acquired from any common grammar. 146 Greek verbs, how formed.

We have observed above, that the flexion of nouns of the first and second declensions are formed by annexing fragments of the articles to the radical words; and that the variation of the tenses was produced by joining the substantive verb, according to the same analogy. Every Greek verb was originally an inflexible biliteral, triliteral, quadriliteral or dissyllabic radix. The variations were formed a long while after in the manner above intimated.

The Greeks had their substantive or auxiliary verb, from the Phœnician or Chaldean verb הוה, *fuit*. This verb, taking away the gentle aspirate from both beginning and end, actually becomes ε. This vocable the Greeks brought along with them from the East, and manufactured after their own manner, which appears to have been thus:

Pres.	εω, εις, ει,	εομεν, εετε, εουσι,
Cont.	ω, εις, ει,	ουμεν, ειτε, ουσι,
Fut.	εσω, εσεις, εσει,	εσομεν, &c.

We place ουσι in the third person plural, because for many centuries ομικρον supplied the sound of the diphthong ου. By these variations it will appear that the radical verb was rendered capable of inflection. We have observed that Greek verbs were a collection of biliteral,

Exemplum Ionicarum Priscarum

Literarum ex columna, quæ in via Appia reperta, postea ad hortos Farnesianos traducta est.

ODENI. ΘEMITON. METAKINESAI.EK.TO. TPIOPIO. HO

ESTIN. EPI. TO. TRITO. EN. TEI. HODOI. TEI. APPIAI. EN TOI

HERODO. AAROI. OAAR. LOION. TOI. KINESANTI. MARTVS

DAIMON. ENHODIA. KAI. HOI. KIONES. DEMETROS

KAI. KORES. ANAΘEMA. KAI. ΘONION. ΘEON. KAI.

Sanscrit Alphabet.

Vowels.

अ	आ	इ	ई	उ	ऊ	ऋ	ॠ	ऌ	ॡ	ए	ऐ	ओ	औ	अं	अः
ă or ĕ	*a*	*ĕe*	*ee*	*ŏo*	*oo*	*rŭ*	*ru*	*lŭ*	*lru*	*ăe*	*ei*	*o*	*au*	*un*	*ah, or ch*

Connected Vowels.

क का कि की कु कू कृ कॄ कॢ कॣ के कै को कौ कं कः

Consonants.

क	ख	ग	घ	ङ	च	छ	ज	झ	ञ	ट	ठ	ड	ढ	ण	त	थ
kĕ	*khĕ*	*gu*	*ghu*	*n or ngĕ*	*chi*	*chha*	*ja*	*jha*	*nya*	*ta*	*tha*	*de*	*dhe*	*na*	*te*	*thĕ*

द	ध	न	प	फ	ब	भ	म	य	र	ल	व	श	ष	स	ह	क्ष	ज्ञ
dĕ	*dhĕ*	*ne*	*pa*	*pha*	*bĕ*	*bhe*	*mĕ*	*yĕ*	*ră*	*lĕ*	*wĕ*	*să*	*sha*	*izh*	*kha*	*x*	*jnya or gya*

W. Archibald Sculp.

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literal, triliteral, or quadriliteral, radical words.—The following may serve for examples: τι, λεγ, Μαξ, τυπ, φαν, ταν, ϱαπ, Δαμ, Δηλ, Δεικ.

These radicals are taken at random; and we believe our Grecian student, by adding the terminations, will readily find them all significant verbs. With these radicals, then, and the substantive verb, we suppose the present and future tenses were formed.

147 Original present that which is now the second future.

But it is now generally admitted that the modern present was not the original one of the verb. The second, or Attic future, appears plainly to have been the most ancient present. When the language was improved, or rather in the course of being improved, a new present was invented, derived indeed from the former, but differing widely from it in its appearance and complexion. Upon this occasion, the old present was degraded, and instead of intimating what was *doing at present*, was made to import what was immediately to be done hereafter. By this means, γϱαφεω, contracted into γϱαφῶ, *I am writing*, came to intimate *I am just going to write*. This change was probably made for the sake of enriching the language, for variety, for energy. Thus, τυπεω contracted τυπῶ became τυπτω, τικῶ, τικτω, &c. According to this theory, we find, that such verbs as now have no second future retain their original form, only the circumflex has been removed in order to accommodate them to the general standard. Grammarians have now chosen the three characteristic letters of active verbs from the present, first future, and perfect. The true characteristic of the original verb was that of the present second future. Many verbs are now destitute of that tense, because since the invention of the new present, those have fallen into disuse.

148 Formation of the modern present.

Let us now take the verb λεγω, *dico*, in order to make a trial; and let us write the radix and the auxiliary, first separately, and then in conjunction: Thus,

λεγ-εω, λεγ-εες, λεγ-εε, λεγ-εομεν, λεγ-εετε, λεγ-εουσι. Then we will have contracted λεγῶ, λεγεῖς, λεγεῖ, λεγοῦμεν, λεγεῖτε, λεγουσι. Here, we believe, every thing is self-evident.

The English would run thus: Saying *I am*, saying *thou art*, saying *he is*, &c. At first the radix and the auxiliary were pronounced separately, as we do our helping verbs in English, and would have been written in the same manner had words been then distinguished in writing.

149 First future, and

The present first future occupied the same place that it now does, and concurred in its turn to complete the future in conjunction with the radix. That the substantive verb was inflected in the manner above laid down, is obvious from its future middle εσομαι, and from the future of the Latin verb *sum*, which was of old *eso*, *esis*, &c. Verbs in λω, μω, νω, ϱω, often take σω in the first future. See *Fœd. Cret. ap. Marm. Oxon.* lib. 87. Verbs in λω and ϱω assume σ by analogy, as κελλω, κελσω, *Eurip. Hecub.* v. 1057. κελσαι, *Hom. Od.* x. v. 511. τελλω, τελσω, *unde* τελσον, *Il.* x. v. 707. ὀϱω. ὀϱσουσι, *Pind. Nem. Od.* 9. *Duodec.* 2. τειϱω. τεϱσει, *Theoc. Idyll.* 22. v. 63. In fine, the Æolic dialect after the liquids often inserts σ.

It must be observed, that the Greeks, in order to accelerate the pronunciation, always throw out the ε and ε, except in verbs ending in αω, εω, οω; where they generally change them into η and ω. When the last letter of the radix can coalesce with σ after ε is thrown out, they transform it, so as to answer that purpose; if not, they sometimes throw it out. We shall once more take λεγω for an example:

λεγ-εσω, λεγ-εσεις, λεγ-εσει, &c.

Throwing out ε, it would stand λεγ-σω, λεγ-σεις, &c. by changing γς into ξ it becomes λεξω. Δ θ and σ cannot coalesce with σ, therefore they throw them out: thus, Αδω, future first ασω; πληθω, future first πλησω; Ανυτω, Ανυσω, &c.

These are the general rules with respect to the formation of the present and future of active verbs in the earliest stages of the Greek language. The limits prescribed will not allow us to pursue these conjectures; but the reader may, if he thinks proper, carry them a great way.

The preterite tense falls next under consideration. If we may trust analogy, this, as well as the other two, must have owed its conformation to the radix of the verb, and some other word fitted to eke out its terminations. It has been thought by some critics, that this addition was taken from the Hebrew word היה; and we should be of the same opinion did not another auxiliary present itself nearer home, which appears to us much more congruous to such a purpose. Perhaps, indeed, the people from whom we suppose it borrowed, derived it from the eastern quarters. We have already observed, that the Thracians were masters of a great part of Greece in the very earliest ages. At that time they were a polite and learned people. From them a considerable part of the Greek language was derived. If, therefore, we should find a word in their language employed for the same purpose, and accommodated to coalesce with the radical verb, we feel ourselves very much inclined to prefer such a word.

150 preterite tense.

151 Origin of the auxiliary verb.

The word *ha* pervades many different languages as an auxiliary verb. From it we have the Italian *ho*, the Spanish *he*, the French *ai*; and in one shape or other it appears in all the German and Scandinavian dialects. It is the Gothic auxiliary; and, we believe, it forms the termination of the perfect active of the first conjugation in the Latin tongue: For there *am* is the radix of *amo*; in the preterite *am-avi*, *amavi*: and the preterperfect *am-hav eram*, i. e. *amaveram*, compounded of *am*, *hav*, and *eram*, the imperfect of the indicative of the substantive verb. This process, in the formation of the preterite of Latin verbs, will scarce be questioned, and forms certainly a presumptive proof that the Greeks pursued the same line. From this verb is likewise derived the Latin *habeo*, by changing *v* into *b*, which are indeed the same letter. Our readers, after this detail, will not be surprised if we should now hazard a conjecture, and declare it as our opinion, that this same Gothic auxiliary *ha* is actually the additional part of the preterite of Greek verbs, and that part upon which the conjugation depends.

In forming this combination between the radix and the auxiliary, the Greeks were obliged to fabricate several devices. As often as the last letter of the radix could not unite with the aspirate in *ha*, they metamorphosed it into one of the double letters, which are capable of coalescing with it. In the verb λεγω, γ was changed into χ; thus, λεγ *ha* became λεχα, τυπτω preterite τυπ *ha*, was combined into τυφα. In verbs which

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which had a radix that would not admit this conjunction, they hardened the *h* into κ, as in τιω, preterite τι-κα, λκευ-κα. Many other ways were contrived to facilitate this re-union. These are detailed in every Greek grammar, and so need not be mentioned.—What has been said with respect to this configuration, we offer as a pure conjecture, without the most remote intention of obtruding it upon our readers.

If it is admitted, that the auxiliary *ha* formed the conjugating termination of the active verb among the Greeks, it will likewise be admitted, that the radical verb and the other made originally two distinct words: that, according to this scheme, the preterite would proceed thus, λεγ *ha*, said *I have*; λεγ *has*, said *thou hast*; λεγ *he*, said *he hath*, &c. This process to us appears rational, elegant, and advantageous. The pluperfect was not then invented, and therefore it does not come under our consideration. The other tenses were all deduced from those described; and in forming these intermediate distinctive tenses, we believe that both critics and grammarians, and perhaps philosophers too, were employed. See GRAMMAR.

The eastern nations have diversified their verbs, by affixing fragments of the personal pronouns to the radix, by which they gained only the advantage of exhibiting the genders of the persons engaged in being, acting, and suffering; but a perpetual repetition of these was unavoidable. The Greeks, by their artificial combination of the radix with the two auxiliaries, avoided the necessity of repeating their personal pronouns, as we and the other modern inhabitants of Europe are obliged to do; and at the same time, by diversifying the terminations of their nouns and verbs, wonderfully improved the beauty and harmony of their language. The arrangement above insisted on is so very different from that of the orientals, and so entirely Gothic, that we think there can be no doubt that the Greeks borrowed this manœuvre from the Thracians. Every person moderately acquainted with the Greek language will, upon examination, discover a wonderful coincidence between the structure, idioms, and phraseology, of the English and Greek languages; so many congenial features must engender a strong suspicion that there once subsisted a pretty intimate relation between them.

In the preceding deduction, we find ourselves obliged once more to differ from the very learned author of the *Origin and Progress of Language*. As we took the liberty to question his originality of the Greek language, and at the same time presumed to attack the goodly structure raised by philosophers, critics, and grammarians; so we now totally differ from that learned writer as to his theory of the creation of verbs out of the inhabile matter of αω, εω, &c. This whole fabric, in our opinion, leans on a feeble foundation.

The apparatus of intermediate tenses, of augments, derivation of tenses, with their formation, participles, and idiomatical constructions, and other essentials or appendages, we omit, as not coming within the verge of the disquisition.

The derivation and formation of the middle and passive voices, would certainly afford matter of curious speculation; but the labour necessary to investigate this connection would greatly overbalance the benefit expected.

152 Derivation and formation of the middle voice,

However, to complete our plan, we shall subjoin a few strictures with respect to the formation of the middle voice, which was, in our opinion, immediately formed from the active.

We have seen already, that the active voice in its original state was formed by annexing fragments of the substantive or auxiliary verb to the radix. The same economy was observed in fabricating the flexible parts of the verb of the middle voice. To demonstrate this, we shall first conjugate the present tense of the auxiliary passive upon the principles above laid down.

Present, Εσμαι, εσαι, εσται, εσμεθα, εσθε, εσνται. Such was the passive-present of the auxiliary. We shall now take our example from the verb τυπτω; second future τυπ-εσμαι, *struck I am*, τυπ-εσαι, *struck thou art*, τυπ-εσται, *struck he is*, &c. contracted τυπουμαι, τυπῃ, τυπειται. The conjunction and formation here is obvious. Perhaps, in the second person, σ was inserted, which, however, is thrown out in the process of the persons. The future middle is clearly formed, by affixing the future-passive of the verb εω, only as η was introduced into the language for ε long, it was generally (T) substituted instead of that vowel in verbs ending in αω and εω, and ω for ο in verbs ending in οω; the two vowels ε and ο being originally long as well as short, till η was adopted to denote the long sound of the former, and ω that of the latter. In many verbs, before the conjunction of the radix and auxiliary, ε was thrown out: thus, τυπ-εσομαι became τυψομαι, λεγ-εσομαι, λεξομαι, &c. Plate CCCCXVI

The preterite was deduced from that of the active by a very slight variation, so trifling, indeed, that it need not be mentioned; only we may observe, that the aspirate *h* is never retained in this tense, which originally seems to have been the only distinguishing character by which that tense of the middle voice differed from the same tense of the active.

From the strict analogy between the mode of forming the three primary tenses of the active and middle voice, we are led to suspect that what is now the middle was originally the passive voice.

The immediate formation of the former, by annexing the passive auxiliary, is obvious. The middle voice still partakes of the passive signification, since it has sometimes a passive, though more frequently an active. There are several parts of the present passive quite analogous to the same tenses in the middle: and, lastly, it is the common progress, in the course of improvement, to proceed step by step, and by approximation. What is most simple and easy is the first object, then succeeds what is only a little more difficult, and so on till we arrive at the last stage, when human ingenuity can go no farther. Now, it will readily be admitted, that the passive voice is much more embarrassed and intricate in its texture than the middle; and, therefore, the

(T) We say generally, because in verbs ending in εω, the ε is sometimes retained, as τελεω, τελεσω, αρκεω-εσω.

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the former should have been posterior in point of time to the latter.

We are well aware, that the very learned Kuster, and most other moderns, deeply skilled in the origin, progress, and structure, of the Greek language, have thought otherwise. The general opinion has been, that the Greek middle voice answered exactly to the Hebrew conjugation *hithpachal*, and in its pristine signification imported a reciprocality, or when the *agent acts upon itself*. For our part, we only intended a few hints upon the subject, which our learned readers may pursue, approve, or reject, at pleasure.

153 and of the passive.

If we might pretend to investigate the formation of the passive voice, we should imagine that the modern present was formed from the ancient one, by inserting such letters as were found necessary for beauty, variety, energy, &c.; the first future from the second future middle of the verb τιθημι, once θεω. This future is θησομαι; and, joined to the radix, always occupies that place, τι-θησομαι, τελεθησομαι, φλεχθησομαι, τυφθησομαι, and so of the rest: whether μαι, σαι, ται, which occur so frequently as the terminations of the middle and passive voices, are fragments of some obsolete verb, we will not pretend to determine.

From verbs in αω, εω, οω, υω, are formed verbs in μι; which in the present, imperfect, and second aorist, as it is called, only have a different form, by assuming μι with a long vowel preceding it, in the present active; which vowel is preserved in each person singular. This collection of irregular verbs seems to be formed from the verb ειμι, which in some dialects might be ημι. Indeed the imperfect ην, ης, η, seems to imply as much: in this, however, we dare not be positive.

In the whole of this analysis of the formation of verbs, we have laid down what to us appears most plausible. That metaphysical critics may discover inaccuracies in the preceding detail we make no doubt; but our candid readers will doubtless reflect, that no language was ever fabricated by philosophers, and that the elements of language were hammered out by peasants, perhaps by savages. Critics have created a philosophy of language we admit, and have a thousand times discovered wonderful acuteness and ingenuity in the mechanism of words and sentences, where the original onomathetæ never apprehended any, and which possibly never existed but in their own heated imagination. If our more enlightened readers should find any thing in the preceding detail worthy their attention, so much the better; if the contrary should happen, we presume they will take up with the hackneyed system. We have all along neglected the dual number, because it regularly follows the type of the other numbers.

Be that as it may, before we drop this subject we must take the liberty to subjoin an observation or two with respect to the consequences of the practice of new modelling the present, and of course the imperfect, tenses of verbs. 1st, After this arrangement they commonly retained all the other tenses exactly as they had stood connected with the primitive verb: this needs no example. 2d, They often collected the tenses of verbs, whose present and imperfect were now obsolete, in order to supply this defect. Thus we have Φερω-Οισω, ενεγκα, ηνεγκα. 3d, They often formed present and imperfect tenses without any other tenses annexed: The poets in particular seem to have fabricated these two tenses at pleasure.

If this procedure was convenient for the poets, it was certainly most incommodious with respect to the vulgar, as well as to foreigners who had an inclination to learn the language. The vulgar, some ages after Homer and Hesiod, must have found it as difficult to understand their poems as our people do to comprehend those of Chaucer and Spenser. By this disposition, too, the etymology of verbs was almost entirely confounded. The present second future being, as has been observed, the ancient present, the attention of the curious etymologist was naturally diverted to the modern present, where it was utterly impossible to discover the radical word. A few examples will elucidate this point: τεινω, *to stretch, to extend*, old present τανω; ταν is the radix, which at once appears to be a Persian word signifying *a large tract of country*. Hence *Mauritania* "the land of the Mauri," Aquitania, Bretania; and with *s* prefixed Hindo-stan, Chusi-stan, Turque-stan. The obsolete verb οπω, whence οπτομαι, is evidently derived from *op*, an Egyptian name of the moon: φαινω, second future φανῶ, *to show*, from the Egyptian word *phan* or *pan*, a name of the sun: τυπτω, future second τυπῶ; τυπ is obviously the offspring of תף, *thaph*, "a drum or timbrel," from beating or striking, &c. In such etymological researches, the student must be careful to turn the Ionic η into the Doric α; because the Dores were latest from the coast of Palestine, and consequently retained the largest share of the Phœnician dialect: thus γηθεω, *to rejoice*, turning η into α becomes γαθεω. This word, throwing away the termination, becomes *gath*, plainly signifying a *wine press* (H). It is likewise to be observed, that the Æolians often change α into υ, as συρξ instead of σαρξ, &c.

It is not our intention to enter into the arrangement and peculiar constructions of the Greek language. There is, however, one, which we cannot well pass over in silence. As that tongue is destitute of those words which the Latins call *gerunds*, to supply this defect they employ the infinitive with the article prefixed: thus, Εις το ειναι αυτȣς φιλȣς, *in order to their being friends*; απο τȣ ἑλεσθαι αυτους Βασιλεα, *from their having elected a king*; Εκ τȣ απο φευγειν αυτȣς εκ της πολεος, *from their flying out of the city*. In these phrases the infinitive is said to assume the nature of a substantive noun; agreeing with the article before it, exactly as if it were a noun of the neuter gender. Idioms of this kind occur in our own tongue; only with us the verb, instead of being expressed in the infinitive, is turned into the participle. According to this arrangement, the first of the preceding phrases, which, according to the Greek, would stand *toward to be friends*, in English is, *in order to their being friends*. This anomaly, then, if indeed it be such, is of no manner of consequence. The French, if we are not mistaken, would express it in the very same manner with the Greek, that is, *pour etre amis*.

154 Greek infinitives used as nouns.

From treating of verbs, we should naturally proceed to

(H) Hence it came to signify rejoicing, from the mirth and revelry attending the treading of the vine-press.

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to the conſideration of adverbs, which are ſo denominated, becauſe they are generally the concomitants of verbs. Every thing relating to that part of ſpeech, in the Greek tongue, may be ſeen in the Port Royal or any other Greek grammar. Inſtead therefore of dwelling upon this beaten topic, we ſhall hazard a conjecture upon a point to which the critics in the Greek tongue, as far as we know, have not hitherto adverted.

155 Greek particles of oriental extraction.

The moſt elegant and moſt admired writers of Greece, and eſpecially Homer, and after him Heſiod, abound with ſmall particles, which appear to us pure expletives, created as it were to promote harmony, or fill up a blank without ſenſe or ſignification. How thoſe expletive particles ſhould abound in that language beyond any other, we think, is a matter not eaſy to be accounted for. It has been ſaid by the Zoili, that if you extract theſe nonentities from the poems of that bard, *qui ſolus meruit dici poeta*, a *magnum inane*, a mighty blank, would be left behind. We would willingly do juſtice to that pigmy race of words, and at the ſame time vindicate the prince of poets from that groundleſs imputation. Plato likewiſe, the prince of philoſophers, has been often accuſed of too frequently employing theſe ſuperfluous auxiliaries.

Thoſe particles were no doubt imported from the eaſt. It would be ridiculous to imagine that any deſcription of men, however enthuſiaſtically fond they might be of harmonious numbers, would ſit down on purpoſe to fabricate that race of monoſyllables purely to eke out their verſes; mere ſounds without ſignificancy. In the firſt place, it may be obſerved, that there is a very ſtrict connection among the particles of all cognate languages. To this we may add, that the not underſtanding the nature, relations, ſignification, and original import of thoſe ſeemingly unimportant terms, has occaſioned not only great uncertainty, but numberleſs errors in tranſlating the ancient languages into the modern. The Greek language in particular loſes a conſiderable part of its beauty, elegance, variety, and energy, when theſe adverbial particles with which it is replete are not thoroughly comprehended. An exact tranſlation of theſe ſmall words, in appearance inſignificant, would throw new light not only on Homer and Heſiod, but even upon poets of a much poſterior date. Particles, which are generally treated as mere expletives, would often be found energetically ſignificant. It is however, altogether impoſſible to ſucceed in this attempt without a competent ſkill in the Hebrew, Chaldaic, Arabian, Perſian, and old Gothic languages. We ſhall here take the liberty to mention a few of theſe particles which are moſt familiar, one or other of which occur in almoſt every line of Homer, and which we believe are either not underſtood or miſunderſtood. Such are Δα, δη, μην, ητοι, μαν, γε, ερι, αρα, ρα, γεν. Δα is nothing elſe but the Chaldaic particle δα, the parent of the Engliſh *the*. It likewiſe ſignifies *by turns, in your turn*; δη is the ſame word in the Ionic dialect; μην is a particle of the Hebrew affirmative אמן *amen, fides, veritas*. Μαν, a kind of oath by the moon, called *mona*, almoſt over all the eaſt; hence Dor. μανα; γε, an oath by γεα, that is, *the earth*; αρα, another oath by the ſame element, probably from the oriental word of the ſame import; ρα is a fragment of αρα mentioned before; γεν, of γεα the *earth*, and εν or ων, an Egyptian name of the ſun; ως, *as*, a particle which pervades all the dialects of the Gothic language. In this manner we believe all theſe ſmall words that occur ſo frequently in the Greek tongue, and which have hitherto been held inexplicable, may be eaſily rendered in ſignificant terms: and were this done, we believe they would add both beauty and energy to the clauſes in which they ſtand. But this diſcuſſion muſt be left to more accompliſhed adepts.

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156 Prepoſitions.

We ſhall not explain the nature of prepoſitions, becauſe we are convinced that few people will take the trouble to peruſe this diſquiſition who are not already acquainted with their import in language. The Greek prepoſitions are eighteen in number, which need not be enumerated here. Moſt of theſe might be eaſily ſhown to be particles, or fragments deduced from oriental or Gothic words. The uſe of theſe words is to connect together terms in diſcourſe, and to ſhow the relation between them. In languages where, as in Engliſh, all theſe relations are expreſſed without any change on the termination of the nouns to which they are prefixed, the proceſs is natural and eaſy. The whole is performed by juxtapoſition. But in the Greek and Latin tongues, this effect is produced, partly by prefixing prepoſitions and partly varying the terminations of nouns. Had the Greeks been able to intimate all thoſe relations by varying the terminations, or had they multiplied their prepoſitions to ſuch a number as would have enabled them to expreſs theſe relations without the caſual variations, as the northern languages have done; in either caſe their language would have been leſs embarraſſing than it is in its preſent ſtate. According to the preſent arrangement both prepoſitions and the caſual variations are uſed promiſcuouſly to anſwer that purpoſe; a method which appears to us not altogether uniform. Though this plan might occaſion little embarraſſment to natives, it muſt, in our opinion, have proved ſomewhat perplexing to foreigners. The difficulty would be, as to the latter, when to adopt the one and when the other expedient.

Another inconveniency ariſes from the exceeding ſmall number of prepoſitions in that language, which bear too ſmall a proportion to the great variety of relations which they are appropriated to expreſs. This deficiency obliged them often to employ the ſame prepoſition to denote different relations: For inſtance, Επι inimates, 1ſt, *upon*; as επι του λιθου, *upon the ſtone*; and then it takes the genitive. 2d, It denotes *near upon*; as ἐπι τῳ λιθῳ, and then it governs the dative. 3d, The ſame prepoſition ſignifies *motion towards*; as Επεσεν ἐπι τον λιθον, *he fell upon the ſtone*. In theſe inſtances the ſame prepoſition intimates three different relations; and, which is ſtill more embarraſſing, each of theſe requires a different caſe. The difficulty in this inſtance is ſo conſiderable, that even the moſt accurate of the Greek writers themſelves often either forget or neglect the true application. Many examples of this might be adduced, did the limits aſſigned us admit ſuch illuſtrations. Every man who has carefully peruſed the Grecian authors will readily furniſh himſelf with examples.

157 Irregularly uſed.

Again, ſome prepoſitions, which indicate different relations, are prefixed to the ſame caſe. Thus, εξ ſignifies *from*; as, Εκ Διος αρχωμεσθα, *from Jupiter we begin*; απ εμου βιου, *from my life*, or *my courſe of life*; προ των θυρων, *before the doors*; προ νικης εγκωμιον, *an encomium before the victory*; αντι αγαθων αποδιδοναι κακα, *to render evil*

Greek Language. *evil for good; αντι σου, againſt you.* In theſe examples, and indeed every where, thoſe prepoſitions intimate different relations, and yet are prefixed to the ſame caſes. Sometimes the ſame prepoſition ſeems to aſſume two oppoſite ſignifications: this appears from the prepoſition αντι juſt mentioned, which intimates both *for*, *inſtead of*, and *againſt* or *oppoſite to*.

What has been obſerved with reſpect to the prepoſitions above mentioned, the reader will readily enough apply to κατα, μετα, δια, περι. Theſe incongruities certainly imply ſomething irregular; and ſeem to intimate that thoſe anomalies were ſo deeply incorporated with the conſtitution of the language, that the ſubſequent improvers found it impoſſible to correct them. Indeed to prefix a prepoſition to a caſe already diſtinguiſhed by the affixed termination, appears to us a ſuperfluity at leaſt, if not an abſurdity; for certainly it would have been more natural to have ſaid εκ Ζευς αρχεμεθα, than ἐκ Διος αρχομεθα. Some very learned men, who have inquired into *the origin of language*, have been of opinion that prepoſitions were the laſt invented ſpecies of words. If this opinion be well founded, we may ſuppoſe (and we think that this ſuppoſition is not altogether improbable) that the caſual terminations of the Greek language were firſt affixed to the radix, in the manner above exhibited; and that prepoſitions were afterwards fabricated and prefixed to the caſes already in uſe.

The ſyntax or conſtruction of the Greek language does not, according to our plan, come within the compaſs of our preſent inquiry. This the curious Greek ſtudent will eaſily acquire, by applying to the grammars compoſed for that purpoſe. We have already hazarded a few conjectures with reſpect to the formation of the moſt important and moſt diſtinguiſhed claſſes of words into which it has been divided by the moſt able grammarians, without, however, deſcending to the minutiæ of the language. As prepoſitions are the chief materials with which its other words, eſpecially verbs are compounded, we ſhall briefly conſider the order in which they probably advanced in this proceſs.

158 uſed in compoſition. Complex ideas are compounded of a certain number or collection of ſimple ones. Of thoſe complex notions, ſome contain a greater and ſome a ſmaller number of ſimple conceptions. In language, then, there are two ways of expreſſing thoſe complex ideas, either by coining a word to expreſs every ſimple idea ſeparately, according to the order in which they ſtand in the mind; or by trying to combine two or more ſimple terms into one, and by that method to intimate one complex idea by one ſingle word. The Arabians, notwithſtanding all the boaſted excellencies of their language, have never arrived at the art of compounding their words, in order to anſwer this noble purpoſe; and the ſiſter dialects are but ſlenderly provided with this ſpecies of vocables. The Greeks, of all other nations (except perhaps thoſe who ſpake the Sanſcrit language), are unrivalled in the number, variety, propriety, elegance, energy, and expreſſion of their compound terms. The Greeks, like the Arabians, in the earlieſt ſtages of their language, had only a collection of radical disjointed words, conſiſting of the jargons of the aboriginal Greeks, of the Pelaſgi, Thracians, &c. How theſe words were arranged and conſtructed, we have no data remaining upon which we can found a critical inveſtigation. We muſt therefore remain ſatisfied with ſuch probable conjectures as the nature of the caſe, and the analogy of the language, ſeem to ſuggeſt.

The prepoſitions were originally placed before the nouns, whoſe relations they pointed out. For example, let us take the ξυναπεθνησκετο τοις ἀλλοις, *he died along with the reſt*, or *he died out of hand along with the others.* Theſe words were arranged thus: απεθνησκετο συν τοις αλλοις; and απο-θνησκον συν τοις αλλοις. In this manner the parts of every compound word were placed ſeparately, at leaſt as much as other words which had no connection.

159 The firſt compound words in Greek. The firſt compound words of the Greek language were the radical nouns with the article, and the radical part of the ſubſtantive or auxiliary verb. The ſucceſs of this experiment encouraged them to attempt the ſame in other words. By this noble invention they found themſelves able to expreſs, in one word, with eaſe and ſignificancy, what in other languages, and formerly in their own, required a tedious ambages or circumlocution. In proceſs of time, as their language was gradually mellowed, they increaſed the number of their compounds, till their language, in that reſpect, infinitely excelled all its parent dialects. In this proceſs they were careful to unite ſuch letters as not only prevented aſperity and difficulty of pronunciation, but even promoted harmony and elegance. But this was the labour of poſterior ages.

The Greeks were entirely ignorant of the derivation or etymology of their language: for this we need only conſult Plato's Cratylus, Ariſtotle's Rhetoric, Demetrius Phalereus, Longinus, &c. In deducing patronymics, abſtracts, poſſeſſives, gentiles, diminutives, verbals, &c. from radicals of every kind, they have ſhown the greateſt art and dexterity. Examples of this occur almoſt in every page of every Greek author. But this extended no farther than their own language; every foreign language was an abomination to the Greeks. But more of this in the ſequel.

160 Original materials of the Greek language. The original materials of the Greek tongue were undoubtedly rough and diſcordant, as we have deſcribed them above. They had been collected from different quarters, were the produce of different countries, and had been imported at very diſtant periods. It would therefore be an entertaining, if not an inſtructing, ſpeculation, if it were poſſible to diſcover by what men and by what means, this wonderful fabric was founded, erected, and carried to perfection. The writers of Greece afford us no light. Foreigners were unacquainted with that originally inſignificant canton. Every thing beyond Homer is buried in eternal oblivion. Orpheus is indeed reported to have compoſed poems; but theſe were ſoon obliterated by the hand of time. The verſes now aſcribed to that philoſophical hero are none of his *. Linus wrote, in the Pelaſgic dialect, the atchievements of the firſt Bacchus; Thamyris the Thracian wrote; and Pronapides the maſter of Homer was a celebrated poet. The works of all theſe bards did not long ſurvive; and it is a certain fact that the Greek tongue was highly poliſhed even more early than the age in which theſe worthies flouriſhed. Homer, no doubt, imitated their productions, and ſome are of opinion that he borrowed liberally from them. The Greeks knew no more of the original character of their language, than of the original character and complexion of

* Pauſan. lib. i. cap. 22.

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of their progenitors. They allowed, indeed, that their language was originally barbarous and uncouth; but by what means or by what perſons it was poliſhed, enriched, and finally arranged, was to them an impenetrable ſecret.

We have already demonſtrated that the Ionim or aborigines of Greece were a race of barbarians; that conſequently their language, or rather their jargon, was of the ſame contexture. The Pelaſgi found both the people and their ſpeech in this uncultivated ſtate. Theſe people arrived in Greece about the year before Chriſt 1760. It was then that the language of Greece began to be cultivated. Before the age of Homer the work ſeems to have been completed. Nothing of conſequence was afterwards added to the original ſtock; on the contrary, not a few moities were deducted from the Homeric treaſure. The Pelaſgi, as was ſaid before, arrived in Greece *an. ant. Chr.* 1760. Homer is thought to have been born *an. ant. Chr.* 1041; conſequently the cultivation of the Greek tongue was completed in a period of about 700 years. But upon the ſuppoſition that Orpheus, Linus, Thamyris, &c. wrote long before Homer, as they certainly did, that language had arrived nearly at the ſtandard of perfection two centuries before; by which computation the period of its progreſs towards its ſtationary point is reduced to 500 years. But as the Pelaſgi were a colony of foreigners, we ought to allow them one century at leaſt to ſettle and incorporate with the natives, and to communicate their language, laws, manners, and habits, to the aborignes of the country. By this deduction we ſhall reduce the term of cultivation to leſs than four centuries.

161 which was carried to its utmoſt perfection at a very early period.

During this period Greece was furiouſly agitated by tumults and inſurrections. That country was divided into a number of independent ſtates, which were perpetually engaged in quarrels and competitions. The profeſſion of arms was abſolutely neceſſary for the protection and preſervation of the ſtate; and the man of conduct and proweſs was honoured as a demi-god, and his exploits tranſmitted with eclat to poſterity. The Greek tongue was then rough and unpoliſhed; becauſe, like the ancient Romans, the braveſt men were more diſpoſed to act than to ſpeak. Every language will take its colour from the temper and character of thoſe who employ it; and had it not been owing to one claſs of men, the Greek tongue would have continued equally rough to the era of Homer as it had been a century after the arrival of the Pelaſgi.

There has appeared among barbarous or half-civilized people a deſcription of men whoſe profeſſion it has been to frequent the houſes or palaces of the great, in order to celebrate their achievements, or thoſe of their anceſtors, in the ſublimeſt ſtrains of heroic poetry. Accordingly, we find that the Germans had their *bards*, the Gauls their *fadr*, the Scandinavians their *ſcalds* or *ſcaldres*, the Iriſh their *fileas*, all retained for that very purpoſe. They lived with their chieftains or patrons; attended them to battle; were witneſſes of their heroic deeds; animated them with martial ſtrains; and celebrated their proweſs, if they proved victorious; or, if they fell, raiſed the ſong of woe, and chanted the mournful dirge over their ſepulchres. Theſe bards were always both poets and muſicians. Their perſons were held ſacred and inviolable. They attended public entertainments, and appeared in all national conventions. The chief of them were employed in the temples of the gods; and the leſs illuſtrious, like our minſtrels of old, ſtrolled about from place to place, and exerciſed their functions wherever they found employment.

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162 by the poets, who made a

Among the ancient Greeks there was a numerous tribe of men of the very ſame deſcription, who were at once poets and muſicians, and whoſe office it was to celebrate the praiſes of the great, and to tranſmit their exploits to poſterity in the moſt exaggerated encomiums. Theſe poetical vagrants were ſtyled *Αοιδοι* or ſongſters. Some of theſe lived in the houſes of great men; while others, leſs ſkilful or leſs fortunate, ſtrolled about the country in the manner above deſcribed. The more illuſtrious of theſe *Αοιδοι* who were retained in the temples of the gods, were certainly the firſt improvers of the language of the Greeks. Among the Hebrews we find the firſt poetical compoſitions were hymns in honour of Jehovah, and among the Pagans the ſame practice was eſtabliſhed. In Greece, when all was confuſion and devaſtation, the temples of the gods were held ſacred and inviolable. There the *Αοιδοι* improved their talents, and formed religious anthems on thoſe very models which their progenitors had chanted in the eaſt.

The language of the Greeks was yet rugged and unmellowed: their firſt care was to render it more ſoft and more flexible. They enriched it with vocables ſuited to the offices of religion; and theſe, we imagine, were chiefly imported from the eaſt. Homer every where mentions a diſtinction between the language of gods and men. The language of gods imports the oriental terms retained in the temples, and uſed in treating of the ceremonies of religion; the language of men intimates the ordinary civil dialect which ſprung from the mixed dialects of the country. The prieſts no doubt concurred in promoting this noble and important purpoſe. From this ſource the ſtrolling *Αοιδοι* drew the rudiments of their art; and from theſe laſt the vulgar deduced the elements of a poliſhed ſtyle.

163 diſtinction between the language of gods and men.

To theſe *Αοιδοι* of the ſuperior order we would aſcribe thoſe changes mentioned in the preceding part of this inquiry, by which the Greek tongue acquired that variety and flexibility, from which two qualities it has derived a great ſhare of that eaſe, beauty, and verſatility, by which it now ſurpaſſes moſt other languages. The diverſity of its terminations furniſhes a moſt charming variety, while at the ſame time the ſenſe is communicated to the reader or hearer by the relation between them. By this economy the poet and orator are left at liberty to arrange their vocables in that order which may be moſt ſoothing to the ear, and beſt adapted to make a laſting impreſſion on the mind.

Few colonies have emigrated from any civilized country without a detachment of prieſts in their train. The ſupreme powers, whoever they were, have always been worſhipped with muſic and dancing. The Hebrews, Phœnicians, and Egyptians, delighted in theſe muſical and jocund feſtivals. The prieſts who attended the Iones, Dores, Æolians, Thebans, Athenians, &c. from the eaſt, introduced into Greece that exquiſite taſte, thoſe delicate muſical feelings, which diſtinguiſh the Greeks from all the neighbouring nations. Hence that numerous race of onomatapœas, by which the Greek language is inveſted with the power of expreſſing almoſt every paſſion of the human ſoul, in ſuch terms as oblige it to feel and actually

Greek Language. to aſſimilate to the paſſion it would excite. Numberleſs inſtances of this occur in every page of Homer, Heſiod, Pindar, Sophocles, Euripides, and even of Ariſtophanes: to quote inſtances would be to inſult the Greek ſtudent.

Every body knows that the practice of writing in verſe was antecedent to the date of proſaic compoſition. Here, then, the Αοιδοι and the miniſters of religion chiefly diſplayed their ſkill and diſcernment. By a judicious mixture of ſhort and long ſyllables; by a junction of conſonants which naturally ſlide into each other; by a careful attention to the rhythm, or harmony reſulting from the combination of the ſyllables of the whole line—they completed the metrical tone of the verſe, guided by that delicacy of muſical feeling of which they were poſſeſſed before rules of proſody were known among men.

Much liberty was certainly uſed in tranſpoſing letters, in varying terminations, in annexing prefixes and affixes, both to nouns and other kinds of words where ſuch adjuncts were poſſible: and upon this occaſion we think it probable, that thoſe particles of which we have ſpoken above were inſerted like filling ſtones thruſt in to ſtop the gaps or chinks of a building. Verſes were then clumſy and irregular, as the quantity of vowels was not duly aſcertained, and the colliſion of heterogeneous conſonants not always avoided. Probably theſe primitive verſes differed as widely from the finiſhed ſtrains of Homer and his ſucceſſors, as thoſe of Chaucer and Spencer do from the ſmooth poliſhed lines of Dryden and Pope.

164 Earlieſt poets of Greece. The poetical compoſitions of the earlieſt Greeks were not, we think, in the hexameter ſtyle. As they were chiefly calculated for religious ſervices, we imagine they reſembled the Hebrew iambics preſerved in the ſong of Aaron and Miriam, Deborah and Barak, Pſalms, Proverbs, &c. which were indeed calculated for the ſame purpoſe. Archilochus perhaps imitated theſe, though the model upon which he formed his iambics was not generally known. The later dramatic poets ſeem to have copied from the ſame archetypes. Hexameters, it is probable, were invented by Orpheus, Linus, Thamyris, Muſæus, &c. The firſt of theſe travelled into Egypt, where he might learn the hexameter meaſure from that people, who uſed to bewail *Maneros* and *Oſiris* in elegiac ſtrains. This ſpecies of metre was firſt conſecrated to theology, and the moſt profound ſciences of moral and natural philoſophy; at length it was brought down to celebrate the exploits of kings and heroes.

> *Res geſtas regumque, ducumque, et fortia bella,*
> *Quo ſcribi poſſent numero monſtravit* Homerus.

We have hazarded a conjecture above, importing that the earlieſt poetical compoſitions of the Greeks were conſecrated to the ſervice of the gods. We ſhall now produce a few facts, which will furniſh at leaſt a preſumptive evidence of the probability of that conjecture.

165 Orpheus. Orpheus begins his poem with ancient chaos, its tranſformations and changes, and purſues it through its various revolutions. He then goes on to deſcribe the offſpring of Saturn, that is time, the æther, love, and light. In ſhort, his whole poem is ſaid to have been an oriental allegory, calculated to inſpire mankind with the fear of the gods, and to deter them from murder, rapine, unnatural luſts, &c.

166 Muſæus. Muſæus was the favourite ſcholar of Orpheus, or perhaps his ſon. He compoſed prophecies and hymns, and wrote ſacred inſtructions, which he addreſſed to his ſon. He preſcribed atonements and luſtrations; but his great work was a Theogony, or Hiſtory of the Creation, &c.

167 Melampus. Melampus brought the myſteries of Proſerpine from Egypt into Greece. He wrote the whole hiſtory of the diſaſters of the gods. This ſeer is mentioned by Homer himſelf.

168 Olen. Olen came from Lycia, and compoſed the firſt hymn that was ſung in Delos at their ſolemnities; he probably emigrated from Patara a city of Lycia, where Apollo had a celebrated temple and oracle.

The Hyperborean damſels uſed to viſit Delos, where they chaunted ſacred hymns in honour of the Delian god.

169 Homer and Heſiod. To theſe we add the great Homer himſelf, if indeed the hymns commonly annexed to the Odyſſey are his compoſition. Heſiod's Theogony is too well known to need to be mentioned.

From theſe inſtances we hope it appears, that the origin of the poetry of Greece is to be found in the temples; and that there, its meaſure, numbers, rhythm, and other appendages, were originally fabricated.

170 Different dialects, with their origin. The Grecian poets, however, enjoyed another advantage which that claſs of writers have ſeldom poſſeſſed, which aroſe from the different dialects into which their language was divided. All thoſe dialects were adopted indifferently by the prince of poets; a circumſtance which enabled him to take advantage of any word from any dialect, provided it ſuited his purpoſe. This, at the ſame time that it rendered verſification eaſy, diffuſed an agreeable variety over his compoſition. He even accommodated words from Macedonia, Epirus, and Illyricum, to the purpoſes of his verſification: Beſides, the laws of quantity were not then clearly aſcertained; a circumſtance which afforded him another conveniency. Succeeding poets did not enjoy theſe advantages, and conſequently have been more circumſcribed both in their diction and numbers.

The Greek language, as is generally known, was divided into many different dialects. Every ſept, or petty canton, had ſome peculiar forms of ſpeech which diſtinguiſhed it from the others. There were, however, four different dialectical variations which carried it over all the others. Theſe were the Attic, Ionic, Æolic, and Doric. Theſe four dialectical diſtinctions originated from the different countries in the eaſt from which the tribes reſpectively emigrated. The Attics conſiſted, 1ſt, of the barbarous aborigines; 2d, of an adventitious colony of Egyptian Saïtes; 3d, a branch of Ionians from the coaſt of Paleſtine. Theſe laſt formed the old Ionian dialect, from which ſprung the Attic and modern Ionic. The Æolians emigrated from a different quarter of the ſame coaſt; the inhabitants of which were a remnant of the old Canaanites, and conſequently different in dialect from the two firſt-mentioned colonies. The Dores ſprang from an unpoliſhed race of purple fiſhers on the ſame coaſt, and conſequently ſpoke a dialect more coarſe and ruſtic than any of the reſt. Theſe four nations emigrated from different regions; a circumſtance which, in our opinion, laid the foundation of the different dialects by which they were afterwards diſtinguiſhed.

It is impoſſible in this ſhort ſketch to exhibit an exact view of the diſtinguiſhing features of each dialect. Such an analyſis would carry us far beyond the limits of the article.

article in queſtion. For entire ſatisfaction on this head, we muſt refer the Grecian ſtudent to Mattaire's *Græcæ Linguæ Dialecti*, where he will find every thing neceſſary to qualify him for underſtanding that ſubject. We ſhall content ourſelves with the few obſervations following.

The Athenians being an active, briſk, volatile race, delighted in contractions. Their ſtyle was moſt exquiſitely poliſhed. The moſt celebrated authors who wrote in that dialect were the following: Plato, Thucydides, Xenophon, Demoſthenes, and the other orators; Æſchylus, Euripides, Sophocles, Ariſtophanes, Menander, Diphilus, with the other comic and tragic poets. That dialect was either ancient or modern. The ancient Attic was the ſame with the Ionic.

The Ionic, as was ſaid, was the ancient Attic; but when that nation emigrated from Attica and ſettled on the coaſt of Aſia Minor, they mingled with the Carians and Pelaſgi, and of courſe adopted a number of their vocables. They were an indolent, luxurious, and diſſolute people; of courſe their ſtyle was indeed eaſy and flowing, but verboſe, redundant, and without nerves. This, however, is the leading ſtyle in Homer; and after him a prodigious number of writers on every ſubject have uſed the ſame dialect, ſuch as Herodotus of Halicarnaſſus the celebrated hiſtorian; Cteſias of Cnidus the hiſtorian of Perſia and India; Hecatæus of Miletus; Megaſthenes the hiſtorian, who lived under Seleucus Nicator; Hippocrates the celebrated phyſician of Coos; Hellanicus the hiſtorian often mentioned with honour by Polybius; Anacreon of Teia, Alcæus, Sappho of Leſbos, excellent poets; Pherecydes Syrus the philoſopher, and a multitude of other perſons of the ſame profeſſion, whom it would be ſuperfluous to mention upon the preſent occaſion.

The Æolic and Doric were originally cognate dialects. When the Dorians invaded Peloponneſus and ſettled in that peninſula, they incorporated with the Æolians, and their two dialects blended into one produced the new Doric. The original Dores inhabited a rugged mountainous region about Oſſa and Pindus, and ſpoke a rough unpoliſhed language ſimilar to the ſoil which they inhabited. Andreas Schottus, in his obſervations on poetry, lib. ii. cap. 50. proves from an old manuſcript of "Theocritus, that there were two dialects of the Doric tongue, the one ancient and the other modern; that this poet employed Ionic and the modern Doric; that the old Doric dialect was rough and cumbrous; but that Theocritus has adopted the new as being more ſoft and mellow." A prodigious number of poets and philoſophers wrote in this dialect, ſuch as Epicharmus the poet; Ibycus the poet of Rhegium; Corinna the poeteſs of Theſpis, or Thebes, or Corinth, who bore away the prize of poetry from Pindar; Erynna a poeteſs of Leſbos; Moſchus the poet of Syracuſe; Sappho the poeteſs of Mitylene; Pindarus of Thebes, the prince of lyric poets; Archimedes of Syracuſe, the renowned mathematician; and almoſt all the Pythagorean philoſophers. Few hiſtorians wrote in that dialect; or if they did, their works have not fallen into our hands. Moſt of the hymns ſung in temples of the gods were compoſed in Doric; a circumſtance which evinces the antiquity of that dialect, and which, at the ſame time, proves its affinity to the oriental ſtandard.

After that the Greek tongue was thoroughly poliſhed by the ſteps which we have endeavoured to trace in the preceding pages, conſcious of the ſuperior excellency of their own language, the Greeks, in the pride of their heart, ſtigmatized every nation which did not employ their language with the contemptuous title of *barbarians*. Such was the delicacy of their pampered ears, that they could not endure the untutored voice of the people whom they called Βαρβαροφωνοι. This extreme delicacy produced three very pernicious effects; for, 1ſt, It induced them to metamorphoſe and ſometimes even to mangle, foreign names, in order to reduce their ſound to the Grecian ſtandard; and, 2d, It prevented their learning the languages of the eaſt, the knowledge of which would have opened to them an avenue to the records, annals, antiquities, laws, cuſtoms, &c. of the people of thoſe countries, in compariſon of whom the Greeks themſelves were of yeſterday, and knew nothing. By this unlucky bias, not only they, but even we who derive all the little knowledge of antiquity we poſſeſs through the channel of their writings, have ſuffered an irreparable injury. By their transformation of oriental names they have in a manner ſtopped the channel of communication between the hiſtories of Europe and Aſia. This appears evident from the fragments of Cteſias's Perſian hiſtory, from Herodotus, Xenophon, and all the other Grecian writers who have occaſion to mention the intercourſe between the Greeks and Perſians. 3d, It deprived them of all knowledge of the etymology of their own language, without which it was impoſſible for them to underſtand its words, phraſeology, and idioms, to the bottom. We mentioned Plato's Cratylus above. In that dialogue, the divine philoſopher endeavours to inveſtigate the etymology of only a few Greek words. His deductions are abſolutely childiſh, and little ſuperior to the random conjectures of a ſchool-boy. Varro, the moſt learned of all the Romans, has not been more ſucceſsful. Both ſtumbled on the very threſhold of that uſeful ſcience; and a ſcholar of very moderate proficiency in our days knows more of the origin of theſe two noble languages, than the greateſt adepts among the natives did in theirs. By prefixes, affixes, tranſpoſitions of letters, new conjunctions of vowels and conſonants for the ſake of the muſic and rhythm, they have ſo diſguiſed their words, that it is almoſt impoſſible to develope their original. As a proof of this, we remember to have ſeen a manuſcript in the hands of a private perſon where the firſt twelve verſes of the Iliad are carefully analyſed; and it appears to our ſatisfaction that almoſt every word may be, and actually is, traced back to a Hebrew, Phœnician, Chaldean, or Ægyptian original: And we are convinced that the ſame proceſs will hold good in the like number of verſes taken from any of the moſt celebrated poets of Greece. This inveſtigation we found was chiefly conducted by reducing the words to their original invariable ſtate, which was done by ſtripping them of prefixes, affixes, &c. Theſe ſtrictures are, we think, well founded; and conſequently need no apology to protect them.

171 The partiality of the Greeks to their own tongue, and its evil conſequences.

172 Beauty of the Greek language.

Theſe imperfections, however, are counterbalanced by numberleſs excellencies: and we are certainly much more indebted to that incomparable people for the information they have tranſmitted to us through the medium of their writings, than injured by them in not conveying to us and to themſelves more authentic and more ample communications of ancient events and occurrences. Without fatiguing our readers with ſuperfluous encomiums on a language which has long ago been extolled perhaps

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to an extravagant degree by the labours of men of the most enlarged capacity and the most refined taste, we shall now proceed to make a few observations on *spirits* and *accents*; which being rather appendages than essentials of the language, we have on purpose reserved for the last place.

173
The spiritus asper and lenis.

Every word in the Greek language beginning with a vowel is marked with a spirit of breathing: This aspiration is double, namely *lenis et asper*, "the gentle, and rough or aspirated." The gentle accent, though always marked, is not now pronounced, though in the earliest periods of the language it was undoubtedly enounced, though very softly. Both these aspirations were imported from the east. They were actually the Hebrew ה *he* and ח *heth*. The former denoted the *spiritus lenis*, and the latter the *spiritus asper*. The Hebrew prefixed *ha* or *he* to words beginning with a vowel, and of course the Greeks followed their example. These people seem to have delighted in aspirates; and of consequence the letter ς is, some think, rather too often affixed to the terminations of their words. Every word beginning with ρ had the aspirate joined to ρ, probably with a design to render the aspiration still more rough.

174
The accents.

The Greek accents are three in number; the acute, the grave, and the circumflex. The acute raises and sharpens the voice; the grave depresses and flattens it; the circumflex first raises and sharpens the voice, and then depresses and flattens it. It is obviously composed of the other two. The learned author of the *Origin and Progress of Language* has taken much pains to prove that these accents were actually musical notes, invented and accommodated to raise, depress, and suspend the voice, according to a scale of musical proportions. It is scarce possible, we think, for a modern Greek scholar to comprehend distinctly the ancient theory of accents. These the native Greeks learned from their infancy, and that with such accuracy, that even the vulgar among the Athenians would have hissed an actor or actress off the stage or an orator off the pulpitum*, on account of a few mistakes in the enunciation of those notes.

* See *Pulpitum*.

The elevations, depressions, and suspensions of the voice upon certain syllables, must have made their language sound in the ears of foreigners somewhat like recitative, or something nearly resembling *cant*. But the little variety of those syllabic tones, and the voice not resting upon them, but running them on without interruption, sufficiently distinguished them from music or cant. Be that as it may, we think it highly probable, that the wonderful effects produced by the harangues of the orators of Greece on the enraptured minds of their hearers, were owing in a good measure to those artificial musical tones by which their syllables were so happily diversified.

To this purpose we shall take the liberty to transcribe a passage from Dion. Halic. *De Structura Orationis*, which we find translated by the author of the *Origin and Progress of Language*, vol. ii. book 3d, part ii. chap. 7. page 381. "Rhetorical composition is a kind of music, differing only from song or instrumental music, in the degree, not in the kind; for in this composition the words have melody, rythm, variety, or change, and what is proper or becoming: So that the ear in it, as well as in music, is delighted with the melody, moved by the rythm, is fond of variety, and desires with all these what is proper and suitable. The difference, therefore, is only of greater and less."

With respect to accents, it may be observed that only one syllable of a word is capable of receiving the acute accent, however many there be in the word. It was thought that the raising the tone upon more than one syllable of the word, would have made the pronunciation too various and complicated, and too like chanting.

The *grave accent* always takes place when the acute is wanting. It accords with the level of the discourse; whereas the acute raises the voice above it.

The *circumflex accent* being composed of the other two is always placed over a long syllable, because it is impossible first to elevate the voice and then to depress it on a short one. Indeed among the Greeks a long syllable was pronounced like two short ones; and we apprehend it was sometimes written so, especially in later times. It is altogether obvious from two learned Greek authors, Dion. Halic. and Aristoxenus, that the Greek accents were actually musical notes, and that these tones did not consist of loud and low, or simply elevating and depressing the voice; but that they were uttered in such a manner as to produce a melodious rythm in discourse.

In a word, the acute accent might be placed upon any syllable before the antepenult, and rose to a *fifth* in the diatonical scale of music; the grave fell to the third below it. The circumflex was regulated according to the measure of both, the acute always preceding. The grave accent is never marked except over the last syllable. When no accent is marked, there the grave always takes place. Some words are called *enclitics*. These have no accent expressed, but throw it back upon the preceding word. The circumflex, when the last syllable is short, is often found over the penult, but never over any other syllable but the last or the last but one.

175
The ancient Greeks had no accentual marks.

The ancient Greeks had no accentual marks. They learned those modifications of voice by practice from their infancy; and we are assured by good authority, that in pronunciation they observe them to this day. The accentual marks are said to have been invented by a famous grammarian, Aristophanes of Byzantium, keeper of the Alexandrian library under Ptolemy Philopater, and Epiphanes, who was the first likewise who is supposed to have invented punctuation. Accentual marks, however, were not in common use till about the seventh century; at which time they are found in manuscripts. If our curious readers would wish to enter more deeply into the theory of accents, we must remit them to Origin of Language, vol. ii. lib. 2. *passim*; and to Mr Foster's Essay on the different Nature of Accent and Quantity.

Such, in general, are the observations which we thought the nature of our design obliged us to make on the origin and progress of the Greek language. Some of our more learned readers may perhaps blame us for not interspersing the whole disquisition with quotations from the most celebrated writers in the language which has been the object of our researches. We are well aware that this is the general practice in such cases. The books were before us, and we might have transcribed from them more quotations than the nature of an article of this kind would permit. In the first part there were no books in that

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that language to quote from, becauſe the Greeks knew nothing of their own origin, nor of that of their language, and conſequently have recorded nothing but dreams and fictions relating to that ſubject. Even when we had made conſiderable progreſs in our inquiry, the nature of the plan we have adopted excluded in a great meaſure the uſe of quotations. When we drew near the concluſion, we imagined that our learned readers would naturally have recourſe to the paſſages alluded to without our information, and that the unlearned would not trouble themſelves about the matter. The Greek ſtudent who intends to penetrate into the depths of this excellent language, will endeavour to be thoroughly acquainted with the books after mentioned.

176 Books to be ſtudied by every one who wiſhes to be a maſter of this language.

Ariſtotle's Rhetoric and Poetics, his book *De Interpretatione*, eſpecially with Ammonius's Commentary. Ammonius was a native of Alexandria, and by far the moſt acute of all the ancient grammarians.

Dion. Halic. *De Structura Orationis*, where, amidſt abundance of curious and intereſting obſervations, will be found the true pronunciation of the Greek letters.

Demetrius Phalereus *De Elocutione*; a ſhort eſſay indeed, but replete with inſtruction concerning the proper arrangement of words and members in ſentences.

Longinus, the prince of critics, whoſe remains are above commendation. Theodorus Gaza ‡ and the other refugees from Conſtantinople, who found an hoſpitable reception from the munificent family of the Medici, and whoſe learned labours in their native language once more revived learning and good taſte in Europe. Theſe, with ſome other critics of leſs celebrity, but equal utility, will unlock all the treaſures of Grecian erudition, without however diſcloſing the ſource from which they flowed. To theſe one might add a few celebrated moderns, ſuch as Monſ. Fourmont the Elder, Monſ. Gebelin, Abbé Pezron, Salmaſius, and eſpecially the learned and induſtrious Lord Monboddo.

‡ See *Gaza*.

We ſhall now give a very brief account of the vaſt extent of the Greek language even before the Macedonian empire was erected; at which period, indeed, it became in a manner univerſal, much more than ever the Latin language could accompliſh notwithſtanding the vaſt extent of the Roman empire.

177 Vaſt extent of the Greek language.

Greece, originally Hellas, was a region of ſmall extent, and yet ſent out many numerous colonies into different parts of the world. Theſe colonies carried their native language along with them, and induſtriouſly diffuſed it wherever they formed a ſettlement. The Iones, Æoles, and Dores, poſſeſſed themſelves of all the weſt and north-weſt coaſt of the Leſſer Aſia and the adjacent iſlands; and there even the barbarians learned that poliſhed language. The Greek colonies extended themſelves along the ſouth coaſt of the Euxine ſea as far as Sinope, now Trebizund, and all the way from the weſt coaſt of Aſia Minor: though many cities of barbarians lay between, the Greek tongue was underſtood and generally ſpoken by people of rank and faſhion.

There were Greek cities on the north coaſt of the Euxine ſea to the very eaſtern point, and perhaps beyond even thoſe limits; likewiſe in the Taurica Cherſoneſus, or Crim Tartary; and even to the mouth of the Danube, the ſtraits of Caffa, &c. In the neighbourhood of all theſe colonies, the Greek language was carefully propagated among the barbarians, who carried on commerce with the Greeks.

A great part of the ſouth of Italy was planted with Greek cities on both coaſts; ſo that the country was denominated *Magna Græcia*. Here the Greek tongue univerſally prevailed. In Sicily it was in a manner vernacular. The Ionians had ſent a colony into Egypt in the reign of Pſammitichus; and a Greek ſettlement had been formed in Cyrenia many ages before. The Phocians had built Maſſilia or Marſeilles as early as the reign of Cyrus the Great, where ſome remains of the Greek language are ſtill to be diſcovered. Cæſar tells us, that in the camp of the Helvetii regiſters were found in Greek letters. Perhaps no language ever had ſo extenſive a ſpread, where it was not propagated by the law of conqueſt.

178 Greek ſpoken at preſent.

The Greek tongue, at this day, is confined within very narrow limits. It is ſpoken in Greece itſelf, except in Epirus, and the weſtern parts of Macedonia. It is likewiſe ſpoken in the Grecian and Aſiatic iſlands, in Candia or Crete, in ſome parts of the coaſt of Aſia Minor, and in Cyprus: but in all theſe regions, it is much corrupted and degenerated.

As a ſpecimen, we ſhall inſert a modern Greek ſong, and the advertiſement of a quack medicine, which with other plunder, was brought by the Ruſſians from Chocſim or Chotzim in 1772.

Song in modern Greek.

ΜΙ δυσικίαις πολεμῶ μὲ βάσανα ὡς τὸ λεμὸ
Εἶμαι, και κεντινεύω, καὶ νὰ χαθω κοντεύω
Στὸ πέλαγος των συμφορῶν με ἐπικίνδυνον καιρὸν
Μ' ἀνέμυς ὀλάθριυς σφοδρυς και ἐναντιυς.
Με κύματα πολλῶν καὶ μῶν τυφανὶ αναστεναγμῶν.
Θαλασσα φυσκομένη, πολλα ἀγριομένη,
"Οπυ ἀφριζι και φυσα γε σαγανάκια περισσα
Σύνεφα σκοτισμένα καὶ κατασυγχυσμένα,
Και νὰ φανῆ μια σωτηρία, νὰ ιδυν τα μάτια μυςηρια.
Γλίχα νερα νὰ εὕρω, κάσχα καὶ δεν ἠξεύρω.
Ν' ἀραξω και δεν ἠμπορῶ γιατι λιμένα δεν θορῶ.
Μ' ἀπελπισίαν θρέχω στα ἄρμενα πυ ἔχω.
Πυ μὲ αὐτα κἀν νὰ πνιγῶ ἢ σελαμέτινα ευγῶ,
Καὶ τυτα ἂν βαςαξυν, ἐμπορυν νὰ μὲ φυλαξυν.

Tranſlation.

With dire misfortunes, pains, and woes,
O'erwhelm'd, ingulph'd, I ſtruggling fight;
O'er my frail bark proud billows cloſe,
To plunge her deep in laſting night.
Rough ſeas of ills inceſſant roar,
Fierce winds adverſe, with howling blaſt,
Heave ſurge on ſurge. Ah! far from ſhore
My found'ring ſkiff ſhall ſink at laſt.
Involv'd in low'ring darkſome clouds,
'Mid ſultry fogs, I pant for breath;
Huge foaming billows rend my ſhrouds,
While yawning gulfs extend beneath.
From burſting clouds loud thunders roll,
And deaf'ning peals terrific ſpread;
Red lightnings dart from pole to pole,
And burſt o'er my devoted head.
When ſhall the friendly dawning rays
Guide me to pleaſures once poſſeſt;
And breezy gales, o'er peaceful ſeas,
Waft to ſome port of endleſs reſt?

In

In dark despair, with tempests tost,
I veer my sail from side to side.
Conduct me, Heav'n! to yond' fair coast,
Or plunge me in the 'whelming tide.

The Quack Bill.

ΒΑΛΣΑΜΟΝ ΤΗΣ 'ΙΕΡΟΥΣΑΛΗΜ, ΑΠΟ ΤΑΙΣ, ΚΑΙ ΝΟΥΡΙΑΙΣ. ΚΑΙ ΠΑΛΕΑΙΣ ΡΕΤΖΕΤΑΙΣ.

ΤΟΥΤΟ τὸ μπαλσαμον ὠφελεῖ εις τὸ ἀδυνατόν ςομάχι, καὶ βοηθεῖ τὴν χονευσιν δυναμώνει τὴν καρδίαν. συκώνει ὅλας τὰς ἐμφράξεις τῆς κοιλιας ωφελεῖ εἰς τὴν ςένωσιν καὶ βῆχα παλαιὸν. Ἰατρεύει τὰς ἐσωτερικὰς πληγὰς τȣ̃ ςήθȣς, καὶ τȣ̃ πνεύμονος ἤγουν πλεμονιȣ. κινεῖ τα καταμήνια τῶν γυναικῶν. Εἰς τὰς ἐξωτερικὰς πληγὰς πρέπει νὰ βάζεται μὲ τὸ ξυιδὸ τόσον εἰς παλαιάς. Οσον καὶ ἔωνιας, καθὼς εἶναι ἡ σπαθιαῖς, καὶ μαχαιριαῖς. καὶ ἀλλα κοψίματα ἰατρευει κάθελογῆς Φιςολα, καὶ ὅλας τὰς βρομεραὶς πληγὰς ὁπȣ̃ ἔφθασαν εἰς τὸ κόκκαλον θαυμάσιως, ὠφελεῖ εἰς τὰ ἀυτία ὁπȣ̃ τρέχουν ἔμπυον νὰ ςαζεται δυο ἢ τρεῖς κόμπȣς ἤχουν ςαλαγματίας μὲ βαμπάκι βρεμμένον εἰς ἀυτὸ, βάνεται εἰς τὰς πληγωμεναις δοντοκοιλιαῖς καὶ θέλουν ἰατρευθῆ. καὶ ἀκόμι δυναμώνει τὰ ὀδόντια ὁπȣ̃ κινοῦν ται δε θέλουν νὰ πέσουν. βοηθᾶ καὶ ἀπὸ τὴν πανέκλαν.

Ἡ δόσις ἐσωτερικῶς ἂς εἶναι δέκα ἢ καὶ δώδεκα κόμπȣς εἰς ὀλίγον κρασὶ, ἢ καὶ νερον, τὸ κάθε ταχυ καὶ βραδυ. ὡς τὸ μεταχειρίζεται, καὶ εἶνα θαυμάσιον μέτὴν δοκιμὴν βεβαιωμένον.

Ἀληθὲς βάλσαμον τȣ̃ Βασιλεως.

Instead of giving a literal and bald translation of this advertisement, which runs exactly in the style of other quack bills, it may be sufficient to observe, that the medicine recommended is said, when taken inwardly, to raise the spirits, remove costiveness and inveterate coughs; to cure pains of the breast and bellyaches; to assist respiration, and remove certain female obstructions. When applied externally, it cures wounds and sores, whether old or fresh, removes ringing of the ears, fastens the teeth when loose, and strengthens the gums.

All this, and much more, it is said to do in a wonderful manner; and is declared to be the true royal balsam of Jerusalem, and an universal specific.

It is indeed next to a miracle that so many monuments of Grecian literature are still to be found among men. Notwithstanding the burning of the famous library of Alexandria, and the almost numberless wars, massacres, and devastations, which have from time to time in a manner desolated those countries where the Greek language once flourished; we are told that there still remain about 3000 books written in that language.

179 Distinguished stages of the Greek language.

We shall now conclude this section with a brief detail of the most distinguished stages and variations through which this noble tongue made its progress from the age of Homer to the taking of Constantinople, *an. ant. Chr.* 1453; a period of more than 2000 years.

Homer gave the Greek poetry its colour and consistency, and enriched, as well as harmonized, the language. It seems, from the coincidence of epithets and cadence in Homer and Hesiod, that the Greek heroic verse was formed spontaneously, by the old Ἀοιδοι, a sort of *improvisatori*; and that Homer and his first followers adopted their versification. The Iliad and Odyssey have much of the air of extempore compositions; an epithet is never wanting to fill up a verse; and a set of expressions are mechanically annexed to such ideas as were of frequent recurrence. Hence that copiousness and waste of words in the old Greek bard, which forms such a contrast to the condensed and laboured composition of Virgil.

The Greek prose was of a more difficult structure; and it may be distributed into different styles or degrees of purity. Of the prose authors now extant, the first and best style is that of Herodotus, and of Plato in the florid or mixed kind, of Xenophon in the pure and simple, of Thucydides and Demosthenes in the austere. Nothing, perhaps, is so conducive to form a good taste in composition as the study of these writers.

The style of Polybius forms a new epoch in the history of the Greek language: it was the idiotic or popular manner of expression, especially among military men, in his time, about the 150th Olympiad. It became the model of succeeding writers, by introducing a simple unstudied expression, and by emancipating them from the anxious labour of the old Greeks respecting the cadence and choice of words. The style of the New Testament, being plain and popular, frequently resembles that of Polybius, as has been shown by Raphelius, and by Kirchmaier, *de parallelismo* N. T. *et Polybii*, 1725.

Before this historian, the Alexandrian Jews had formed a new or Hellenistic style, resulting from the expression of oriental ideas and idioms in Greek words, after that language had lost of its purity, as it gained in general use, by the conquests of Alexander. The Hellenistic is the language of the Septuagint, the Apocrypha, the New Testament, and partly of Philo and Josephus. This mixture in the style of the evangelists and apostles, is one credential of the authenticity of the best of all books, a book which could not have been written but by Jewish authors in the first century. See the fine remarks of Bishop Warburton, Doctrine of Grace, book i. ch. 8—10. Critics lose their labour in attempting to adjust the Scripture-Greek to the standard of Atticism.

The diction of the Greek historians, and geographers of the Augustan age, is formed on that of Polybius; but improved and modernized, like the English of the present age, if compared with that of Clarendon or Bacon. More perspicuous than refined, it was well suited to such compilations as were then written by men of letters, such as Dionysius, Diodorus, and Strabo, without much experience or rank in public life.

The ecclesiastical style was cultivated in the Christian schools of Alexandria, Antioch, and Constantinople; rank and luxuriant, full of oriental idioms, and formed in a great measure on the Septuagint version. Such is, for instance, the style of Eusebius. After him, the best Christian writers polished their compositions in the schools of rhetoric under the later sophists. Hence the popular and flowing purity of St Chrysostome, who has more good sense than Plato, and perhaps as many good words.

On the Greek of the Byzantine empire, there is a good dissertation by Ducange, *de causis corruptæ Græcitatis*, prefixed to his Glossary, together with Portius's Grammar of the modern Greek. This last stage of the Greek language is a miserable picture of Turkish barbarism.

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barism. And, which is most surprising, there is no city of Greece where the language is more different from the ancient than at Athens. The reason of that is, because it has been long inhabited by a mixed multitude of different nations.

To conclude, the Greeks have left the most durable monuments of human wisdom, fortitude, magnificence, and ingenuity, in their improvement of every art and science, and in the finest writings upon every subject necessary, profitable, elegant, or entertaining.

The Greeks have furnished the brightest examples of every virtue and accomplishment, natural or acquired, political, moral, or military: they excelled in mathematics and philosophy; in all the forms of government, in architecture, navigation, commerce, war: as orators, poets, and historians, they stand as yet unrivalled, and are like to stand so for ever; nor are they less to be admired for the exercises and amusements they invented, and brought to perfection, in the institution of their public games, their theatres, and sports.

180 No perfect translation of any Greek author.

Let us further observe, that in vain our readers will look for these admired excellencies in any of the best translations from the Greek: they may indeed communicate some knowledge of what the originals contain; they may present you with propositions, characters, and events: but allowing them to be more faithful and more accurate than they really are, or can well be, still they are no better than copies, in which the spirit and lustre of the originals are almost totally lost. The mind may be instructed, but will not be enchanted: The picture may bear some faint resemblance, and if painted by a masterly hand give pleasure; but who would be satisfied with the canvas, when he may possess the real object? who would prefer a piece of coloured glass to a diamond? It is not possible to preserve the beauties of the original in a translation.—The powers of the Greek are vastly beyond those of any other tongue. Whatever the Greeks describe is always felt, and almost seen; motion and music are in every tone, and enthusiasm and inchantment possess the mind:

Graiis ingenium, Graiis dedit ore rotundo,
Musa loqui. HORACE.

SECT. VIII. *Of the Latin Language.*

181 Origin of the Romans, and of their language.

THIS language, like every other spoken by barbarians, was in its beginning rough and uncultivated.—What people the Romans were, is a point in which antiquarians are not yet agreed. In their own opinion they were sprung from the Trojans *; Dion. Halicar. derives them from the Greeks †; and Plutarch informs us ‡ that some people imagined that they were sprung from the Pelasgi. The fact is, they were a mixture of people collected out of Latium and the adjacent parts, which a variety of accidents had drawn together, to establish themselves on that mountainous region, in order to secure their own property, and plunder that of their neighbours. They were in all probability composed of Arcadians, Sabines, Latins, Hetruscans, Umbrians, Oscans, Pelasgi, &c.; and if so, their language must have been a mixture of the different dialects peculiar to all these discordant tribes.

* *Tit. Liv.* lib. i. cap. 1. &c.
† *Antiq. Rom.* lib. i.
‡ *Vita Romul.*

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The Latin language ought then to be a mingled mass of the Arcadian, that is, the Æolian || Greek, the Pelasgic, Hetruscan, and Celtic dialects. These jarring elements, like the people to whom they belonged respectively, gradually incorporated, and produced what was afterwards called the *Latin* tongue.

|| *Strabo*, lib. v. *Dionys. Halicarn. Antiq.* lib. i.

The Arcadians were a Pelasgic § tribe, and consequently spoke a dialect of that ancient Greek produced by the coalition of this tribe with the savage aborigines of Greece. This dialect was the ground-work of the Latin. Every scholar allows, that the Æolian Greek, which was strongly tinctured with the Pelasgic, was the model upon which the Latin language was formed. From this deduction it appears, that the Latin tongue is much more ancient than the modern Greek; and of course we may add, that the Greek, as it stood before it was thoroughly polished, bore a very near resemblance to that language. Hence we think we may conclude, that the knowledge of the Latin language is necessary in order to understand the Greek. Let us not then expect to find the real ingredients of the Greek tongue in the academic groves of Athens, or in Smyrna, or in Rhodope, or in Hæmos; but on the banks of the Tiber and on the fields of Laurentum.

§ *Strabo et Herodotus.*

A very considerable part of the Latin tongue was derived from the Hetruscan. That people were the masters of the Romans in every thing sacred. From them they learned the ceremonies of religion, the method of arranging games and public festivals, the art of divination, the interpretation of omens, the method of lustrations, expiations, &c. It would, we believe, be easy to prove, that the Pelasgi * and Hetrusci (x) were the same race of people; and if this was the case, their languages must have differed in their dialect only.

* *Thucydides*, lib. iv.

The Umbrian or Celtic enters deeply into the composition of the Latin tongue. For proof of this, we need only appeal to *Pelloutier*, *Bullet's Memoires de la Langue Celtique, partie premiere*, *Abbé Pezron's Origin of Ancient Nations*, &c. Whether the old Celtic differed essentially from the Pelasgic and Hetruscan, would be a matter of curious investigation, were this a proper subject for the present article.

The Latin abounds with oriental words, especially Hebrew, Chaldaic, and Persian. These are certainly remains of the Pelasgic and Hetruscan tongues, spoken originally by people who emigrated from regions where those were parts of the vernacular language.—The Greeks,

(x) The Hetrusci were variously denominated by the Greeks and Romans. The former called them τυρσηνοι; which was their true name, for they actually emigrated from Tarshish, or the western coast of Asia Minor, and consequently Herodotus every where calls them τυρσηνοι. The Æolians changed α into υ; hence in that dialect they were called τυρσηνοι, from *Tarsus*. The Romans styled them *Tusci*, probably from the Greek verb θυω, *sacrifico*, alluding to the skill which that people professed in the ceremonies of religion. They called their country *Hetruria*, we think from the Chaldaic word *heretum*, "a magician or sorcerer;" a name deduced from their skill in divination.

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Greeks, in poliſhing their language, gradually diſtorted and disfigured vaſt numbers of the rough eaſtern vocables, which made a very great part of it. (See the preceding ſection).

The Romans, of leſs delicate organs, left them in their natural ſtate, and their natural air readily bewrays their original. We had collected a large liſt of Latin words ſtill current in the eaſt; but find that Thomaſſin † and Ogerius (Y), and eſpecially Monſ. Gebelin, in his moſt excellent Latin Dictionary, have rendered that labour ſuperfluous.

† *Gloſſary.*

In this language, too, there are not a few Gothic terms. How theſe found their way into the Latin, it is not eaſy to diſcover, unleſs, as Pelloutier ſuppoſes, the Celtic and Gothic languages were originally the ſame: or perhaps we may conjecture, that ſuch words were parts of a primitive language, which was at one time univerſal.

182 How far the Latin reſembles the Greek.

There are, beſides, in the Latin a great number of obſolete Greek words, which were in proceſs of time obliterated, and others ſubſtituted in their room; ſo that, upon the whole, we are perſuaded, that the moſt effectual method to diſtinguiſh the difference between the early and modern Greek, would be to compare the ancient Latin with the latter; there being, we imagine, very little difference between the ancient Greek and Latin in the earlieſt periods.

However that may be, it is certain that the Roman letters were the ſame with the ancient Greek.—*Formæ literis Latinis quæ veterrimis Græcorum*, ſays Tacitus ‡; and Pliny § ſays the ſame thing, and for the truth of his aſſertion he appeals to a monument extant in his own times.

‡ *Tacitus, Anal.* lib. ii.
§ *Nat. Hiſt.* lib. vii. cap. 58.

Theſe old Greek letters were no other than the Pelaſgic, which we have ſhown from Diodorus Siculus (ſee preceding Section) to have been prior to the Cadmean. For the figure of theſe letters, ſee Aſtle, Poſtellus, Montfaucon, Palæographia Græca, Monſ. Gebelin, and our Plates XV. and XVI.

That the Latins borrowed the plan of their declenſions from the Greeks, is evident from the exact reſemblance of the terminations of the caſes throughout the three ſimilar declenſions. In nouns of the firſt declenſion, the reſemblance is too palpable to ſtand in need of illuſtration. In the ſecond, the Greek genitive is ου. In Latin the *o* is thrown out, and the termination becomes *i*. In the Greek ſection, we have obſerved, that the ſounds of ι and υ differed very little; therefore the Latins uſed ι inſtead of υ. The Latin dative ends in *o*, which is the Greek dative, throwing away ι *ſubſcriptum*, which was but faintly ſounded in that language. No genuine Greek word ended in μ or *m*.

The Hellenes ſeemed to have abhorred that bellowing liquid; it is, however, certain that they imported it from the eaſt, as well as the other letters, and that they employed it in every other capacity, except in that of cloſing words. In the termination of flexions, they changed it into ν.

The Latins retained *m*, which had been imported to them as a terminating letter at an era before the Greek language had undergone its laſt refinement.—Hence the Latin accuſative in *um*, inſtead of the Greek ον. The vocative caſe, we imagine, was in this declenſion originally like the nominative. The Latins have no dual number, becauſe, in our opinion, the Æolian dialect, from which they copied, had none. It would be, we think, a violent ſtretch of etymological exertion, to derive either the Latin genitive plural of the ſecond declenſion from the ſame caſe of the Greek, or that of the latter from the former; we therefore leave this anomaly, without pretending to account for its original formation. The third declenſions in both languages are ſo exactly parallel, that it would be ſuperfluous to compare them. The dative plural here is another anomaly, and we think a very diſagreeable one, which we leave to the conjectures of more profound etymologiſts.

For the other peculiarities of Latin nouns, as they are nearly ſimilar to thoſe of the Greek, we muſt beg leave to remit our readers to that ſection for information. 183

Deficiency of articles.

The Latins have no articles, which is certainly a defect in their language. The Pelaſgic, from which they copied, had not adopted that word in the demonſtrative ſenſe. Homer indeed ſeldom uſes it; and the probability is, that the more early Greek uſed it leſs frequently, at leaſt in the ſenſe above mentioned. Thus in Latin, when I ſay, *video hominem*, it is impoſſible to find out by the bare words whether the word *hominem* intimates "a man," or "the man;" whereas in Greek it would be Βλεπω ἀνθρωπον, *I ſee a man*, Βλεπω τον ανθρωπον, *I ſee the man*. Hence the firſt expreſſion is indefinite, and the ſecond definite. 184

Origin of the ſubſtantive verb,

The ſubſtantive verb *ſum* in Latin ſeems to be partly formed from the Greek and partly not. Some of the perſons of the preſent tenſe have a near reſemblance to the Greek verb ἐω or ἐιμι, while others vary widely from that archetype. The imperfect præterite and præterperfect have nothing common with the Greek verb, and cannot, we think, be forced into an alliance with it. The future *ero*, was of old *eſo*, and is indeed genuine Greek. Upon the whole, in our apprehenſion the Latin ſubſtantive verb more nearly reſembles the Perſian verb *heſten* than that of any other language we are acquainted with. 185

and of other verbs.

From what exemplar the Latin verbs were derived, is not, we think, eaſily aſcertained. We know that attempts have been made to deduce them all from the Æolic Greek, and that the Romans themſelves were extremely fond of this chimera; but the almoſt numberleſs irregularities, both in the formation and conjugation of their verbs, induce us to believe that only a part of them were formed upon that model. We are apt to think that the terminations in *bam, bas, bat, bamus*, &c. are produced by their union with a fragment of ſome obſolete verb, which is now wholly loſt. In the verb *amo*, e. g. we are ſure that the radix *am* is the Hebrew word *mother*; but how *am-abam, am-abo, am-arem* were fabricated, and connected with the radical *am*, is not ſo eaſily determined. That Latin verbs are compoſed of an inflexible radix and another flexible verb, as well as the Greek, cannot be doubted; but what this flexible

(Y) *Græca et Latina lingua Hebraizantes*, Venice 1763. If theſe books are not at hand, Dr Littleton's Dictionary will, in a good meaſure, ſupply their place.

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flexible auxiliary was, we think, cannot now be clearly ascertained. It is not altogether improbable that such parts of the verbs as deviate from the Greek archetype were supplied by fragments of the verb *ha*, which pervades all the branches of the Gothic language, and has, we think, produced the Latin verb *habeo*. When the Greeks began to etymologize, they seldom overpassed the verge of their own language: the Latins pursued nearly the same course. If their own language presented a plausible etymology, they embraced it; if not, they immediately had recourse to the Greek; and this was the *ne plus ultra* of their etymological researches. Cicero, Quintilian, Festus, &c. and even Varro, the most learned of all the Romans, stop here; all beyond is either doubt or impenetrable darkness. The opinion above mentioned we offer only as a conjecture; the decision we leave to more able critics.

186 Deficiencies in Latin verbs.

The want of aorists or indefinite tenses seems to us a palpable defect in the Latin language. The use of these among the Greeks enabled the writer to express the specific variations of time with more accuracy and precision than the Latins, who never attempted to specify them by any other tenses but the imperfect and pluperfect. Indeed we should imagine, that both the Greeks and Latins were much inferior to the English in this respect. The Latin word *lego*, for example, may be translated into English three different ways: 1st, *I read*; 2d, *I do read*; 3d, *I am reading*.

187 Irregularities in the conjugations.

The Latins, in reducing verbs to their four conjugations, formed their inflexions in a very irregular manner. Many verbs of the first class inflect their præterite and supine like those of the second: thus *domo*, instead of giving *avi* and *atum*, has *ui* and *itum*, like *monui* and *monitum*. Again, not a few verbs of the third conjugation have *ivi* and *itum*, as if they belonged to the fourth; e. g. *peto, petivi, petitum*. Then, some verbs have *io* in the present, *ivi* in the præterite, and *itum* in the supine, while, contrary to the rules of analogy, they in reality belong to the third: such are *cupio, cupivi, cupitum, cupere*, &c. Some verbs of the second conjugation have their præterite and supine as if they belonged to the third; thus, *jubeo, jussi, jussum, jubere; augeo, auxi, auctum, augere*. Some verbs, which are actually of the fourth conjugation, have their præterite and supine as if they were of the third; thus *sentio, sensi, sensum, sentire; haurio, hausi, haustum, haurire*, &c. If these are not manifest irregularities, we cannot say what deserves the name. The fact seems to stand thus: The Romans were originally a banditti of robbers, bankrupts, runaway slaves, shepherds, husbandmen, and peasants of the most unpolished character. They were engaged in perpetual broils and quarrels at home, and seldom enjoyed repose abroad. Their profession was robbery and plunder. Like old Ishmael, their hands were against every man, and every man's hand against them. In such a state of society no time was left for cultivating the sciences. Accordingly the arts of war and government were their sole profession. This is so true, that their own poet characterizes them in the following manner:

Excudunt alii spirantia mollius æra, &c.

188 The Latin deficient in participles.

Another blemish in the Latin tongue is occasioned by its wanting a participle of the præterite tense in the active voice. This defect is perpetually felt, and is the cause of an awkward circumlocution wherever it happens to present itself. Thus, "The general having crossed the river, drew up his army;" *Imperator, cum transiisset flumen, aciem instruxit*. Here *cum transiisset flumen* is a manifest circumlocution, which is at once avoided in the Greek ὁ ἡγεμων περασας τον ποταμον, &c. This must always prove an incumbrance in the case of active intransitive verbs. When active deponent verbs occur, it is easily avoided. Thus, "Cæsar having encouraged the soldiers, gave the signal for joining battle;" *Cæsar cohortatus milites, prœlii committendi signum dedit*.

Another palpable defect in this language arises from the want of a participle of the present passive. This again must produce an inconveniency upon many occasions, as will be obvious to every Latin student almost every moment.

189 Supines and gerunds.

The two supines are universally allowed to be substantive nouns of the fourth declension. How these assumed the nature of verbs it is not easy to determine. When they are placed after verbs or nouns, the matter is attended with no difficulty; but how they should acquire an active signification, and take the case of the verb with which they are connected, implies, we should think, a stretch of prerogative.

The Latin gerunds form another unnatural anomaly. Every Latin scholar knows that those words are nothing but the neuters of the participles of the future passive. The fabricators of the Latin tongue, however, elevated them from their primary condition, giving them upon many occasions an active signification. In this case we must have recourse to

——————*Si volet usus,*
Quem penes arbitrium est et jus et norma loquendi.

Another inconveniency, perhaps more severely felt than any of the preceding, arises from the want of the use of the present participle of the verb *sum*. Every body knows what a conveniency is derived from the frequent use of the participle *ων* in Greek; and indeed it appears to us somewhat surprising that the Latins neglected to introduce the participle *ens* into their language. In this we believe they are singular. Here again a circumlocution becomes necessary in such a case as the following: "The senate being at Rome, passed a decree." Instead of saying *senatus ens Romæ, legem tulit*, we are obliged to say *cum senatus Romæ esset*, &c. If the words *ens* or *existens* had been adopted, as in the Greek, this odious circumlocution would have been avoided.

Many other defects of the like kind will occur to every person who shall choose to search for them, and those in the most approved classical authors. Perhaps our mentioning so many may be deemed invidious by the admirers of that language; but we write from conviction, and that must be our apology.

190 Different genius of the Latin and Greek languages.

If one take the trouble to compare the structure of the Greek and Latin languages, he will, we think, quickly be convinced that their characteristic features are extremely different. The genius of the former seems easy and natural; whereas that of the latter, notwithstanding the united efforts of poets, orators, and philosophers, still bears the marks of violence and restraint. Hence it appears that the Latin tongue was pressed into the service, and compelled almost against its will to bend to the laws of the Grecian model. Take a sentence of Hebrew,

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Hebrew, Chaldean, Arabian, &c. and try to translate it into Greek without regarding the arrangement of the words, and you will find it no difficult attempt; but make the same trial with respect to the Latin, and you will probably find the labour attended with considerable difficulty. To translate Greek into English is no laborious task; the texture of the two languages is so congenial, that the words and phrases, and even the idiomatic expressions, naturally slide into each other. With the Latin the case is quite otherwise; and before elegant English can be produced, one must deviate considerably from the original. Should we attempt to translate a piece of English into Greek, and at the same time into Latin, the translation of the former would be attended with much less difficulty than that of the latter, supposing the translator equally skilled in both languages.

191 Causes of this difference.

This incongruity seems to spring from the following cause. Before any man of considerable abilities, either in the capacity of a poet, grammarian, or rhetorician, appeared at Rome, the language had acquired a strong and inflexible tone, too stubborn to be exactly moulded according to the Grecian standard. After a language has continued several centuries without receiving a new polish, it becomes like a full grown tree, incapable of being bent to the purposes of the mechanic. For this reason, it is highly probable, that the tongue in question could not be forced into a complete assimilation with the Greek. Notwithstanding all these obstructions, in process of time it arrived at such an exalted pitch of perfection, as to rival, perhaps to excel, all the other European languages, the Greek only excepted. Had men of the taste, judgment, and industry of Ennius, Plautus, Terence, Cicero, and the worthies of the Augustan age, appeared in the early stages of the Roman commonwealth, we may believe that their language would have been thoroughly reduced to the Grecian archetype, and that the two dialects might have improved each other by a rivalship between the nations who employed them.

Without pretending to entertain our readers with a pompous and elaborate account of the beauties of that imperial language which have been detailed by writers almost without number, we shall endeavour to lay before them as briefly as possible its pristine character, the steps and stages by which it gradually rose to perfection, the period when it arrived at the summit of its excellence, and by what means it degenerated with a rapid career till it was lost among those very people to whom it owed its birth.

192 The Latin tongue composed chiefly of Pelasgic and Celtic words.

We have observed already, that the Latin tongue was a *colluvies* of all the languages spoken by the vagrant people who composed the first elements of that republic. The prevailing dialects were the Pelasgic or Hetruscan, which we think were the same; and the Celtic, which was the aboriginal tongue of Italy. Hence the primary dialect of the Romans was composed of discordant materials, which in our opinion never acquired a natural and congenial union. Be that as it may, this motley mixture was certainly the original dialect of the Romans. The Pelasgic or Hetruscan part of it retained a strong tincture of the oriental style. The Celtic part seems to have been prevalent, since we find that most of the names of places (z), especially in the middle and northern parts of Italy, are actually of Celtic original. It is therefore clear that the style of the first Romans was composed of the languages above mentioned. Who those first Romans were, we believe it is impossible to determine with any degree of certainty. The Roman historians afford us as little information upon that subject, as their etymologists do upon the origin of their language. Their most celebrated writers upon this point were Ælius Gallus, Quintus Cornificius, Nonius Marcellus, Festus, and some others of less note, At the head of these we ought to place Terentius Varro, whom Cicero styles the most learned of all the Romans. From these writers we are to expect no light. Their etymologies are generally childish and futile. Of the language of the most ancient Romans we can only reason by analogy; and by that rule we can discover nothing more than what we have advanced above.

In the first place we may rest assured that the dual number, the articles, the participle above mentioned, the aorists, and the whole middle voice, never appeared in the Latin tongue; and accordingly were not current in those languages from which it was copied, at least at the time when it was first fabricated.

Besides all this, many circumstances concur to make it highly probable that, in the earliest period of the language, very few inflexions were introduced. 1st, When the Pelasgi left Greece, the Greek language itself was not fully polished. 2d, The Arcadians were never thoroughly cultivated. They were a rustic pastoral people, and little minded the refinements of a civilized state; consequently the language they brought into Italy at that era must have been of a coarse and irregular contexture. 3d, When the Thessalian * Pelasgi arrived in Italy about the time of Deucalion, the Greek itself was rude and barbarous; and, which is still of more consequence, if we may credit Herodotus quoted in the former section, that people had never adopted the Hellenic tongue. Hence it appears, that the part of the Latin language derived from the Pelasgic or Hetruscan (for those we believe to have been the same) must have taken a deep tincture from the oriental tongue. (See preceding Section). If we may judge of the Celtic of that age by that of the present, the same character must likewise have distinguished its structure.

* *Dionys. Halicarn.* lib. i.

193 Hence little inflected in its original state.

From these circumstances, we think it appears that the earliest language of the Romans was very little diversified with inflections. It nearly resembled the oriental exemplar, and consequently differed widely from the modern Latin. The effect of this was, that the modern Romans could not understand the language of their early progenitors. Polybius †, speaking of the earliest treaty between the Romans and Carthaginians, makes the following observation: " Believe me (says he), the Roman language has undergone so many changes since that time

† Lib. 3. *sub initio.*

(z) For proof of this our readers may consult Abbé Pezron, Pelloutier, Bullet's *Mem.* Gebelin, *Pref. Dict. Lat.* and many others.

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time (A) to the preſent, that even thoſe who are moſt deeply ſkilled in the ſcience of antiquities cannot underſtand the words of that treaty but with the greateſt difficulty."

From this ſource we make no doubt has flowed that vaſt number of oriental words with which the Latin language is impregnated. Theſe were originally inflexible, like their brethren of the eaſt. They were not diſguiſed as they now are with prefixes, affixes, metatheſes, ſyncopas, antitheſes, &c. but plain and unadorned in their natural dreſs.

194 Bent afterwards into the Grecian model.

After the Romans became acquainted with the Æolian Greeks, who gradually ſeized upon both coaſts of Italy towards the ſouth, which they called *Magna Græcia*, they began to affect a Grecian air, and to torture their language into that foreign contexture. It appears, however, that at firſt the Grecian garb ſat rather awkwardly, and ſeveral marks of violence were eaſily diſcerned. The moſt ancient ſpecimen of this kind that we can recollect conſiſts of the remains of the *twelve tables*. Here every thing is rude and of a clumſy caſt; for though by this time conſiderable progreſs had been made in refinement, and the language of Rome had begun to appear in a Grecian uniform, ſtill thoſe changes were not altogether natural. Soon after appeared Marcus Fabius Pictor and Siſenna; hiſtorians often quoted by Livy, but whoſe works are long ſince irrecoverably loſt. The Faſti Capitolini are often mentioned; but they too periſhed in the burning of the Capitol during the civil wars between Marius and Sylla. Had thoſe monuments eſcaped the ravages of time, we ſhould have been able to mark the progreſs of the Latin tongue from ſtage to ſtage, and to aſcertain with the greateſt accuracy its gradual configuration in the courſe of its progreſs towards the Grecian ſtandard. We muſt therefore leave the Latin tongue during thoſe periods rude and barbarous, and deſcend to others better known and more characteriſtically marked. Thoſe commenced after that

Græcia capta ferum victorem cepit, et artes
Intulit agreſti Latio.

195 The principal authors by whom it was gradually poliſhed.

In this period we find Ennius, who wrote a Roman hiſtory in hexameter verſe in 18 books, which he called *Annals*; moſt part of which is now loſt. He likewiſe tranſlated *Euhemerus de Origine Deorum*; a work often mentioned by the Chriſtan fathers in their diſputes with the Pagans. It is ſometimes quoted by Cicero. Then followed Caius Lucilius the famous ſatiriſt, and a number of other writers, ſuch as Accius, Valerius, Ædituus, Alpinus, &c. whoſe fragments were publiſhed by the Stephens, Paris, 1564. All theſe imitated the writers of Greece or tranſlated from them. By their perſeverance and active exertions the ſpirit of theſe authors was transfuſed into the Latin tongue, and its ſtructure accommodated to the Grecian plan.

Plautus and Terence, by tranſlating the comedies of Menander and Diphilus into their own language, taught the Latin muſes to ſpeak Attic Greek. To ſpeak that language was then the *ton* of the times, as it is now with us to chatter French. Greek tutors were retained in every reputable family; and many Romans of the firſt rank were equally qualified to ſpeak or write both in Greek and Latin. The original jargon of Latium was now become obſolete and unintelligible; and Cato the Ancient condeſcended to learn the Greek language at 80.

196 The golden age of Rome.

To pretend to enumerate the various, and we may add inimitable, examples of the Auguſtan or golden age of the Roman tongue, would be an inſult to the underſtanding of our readers: we ſhall only take the liberty to tranſlate a few lines from a moſt excellent hiſtorian *, who, had his honeſty been equal to his judgment, might have rivalled the moſt celebrated writers of his country. Having obſerved, that the Greek authors, who excelled in every province of literature, had all made their appearance nearly about the ſame ſpace of time, confined within very narrow limits, he adds, "Nor was this circumſtance more conſpicuous among the Greeks than among the Romans; for unleſs we go back to the rough and unpoliſhed times, which deſerve commendation only on account of their invention, the Roman tragedy is confined to Accius and the period when he flouriſhed. The charming wit of Latin elegance was brought to light by Cecilius, Terentius, and Afranius, nearly in the ſame age. As for our hiſtorians (to add Livy alſo to the age of the former), if we except Cato and ſome old obſcure ones, they were all confined to a period of 80 years; ſo neither has our ſtock of poets extended to a ſpace much backward or forward. But the energy of the bar, and the finiſhed beauty of proſe eloquence, ſetting aſide the ſame Cato (by leave of P. Craſſus, Scipio, Lælius, the Gracchi, Fannius, and Ser. Galba, be it ſpoken), broke out all at once under Tully the prince of his profeſſion; ſo that one can be delighted with none before him, and admire none except ſuch as have either ſeen or were ſeen by that orator."

* *Velleius Paterculus*, lib. i. cap. *ult.*

From this quotation it plainly appears, that the Romans themſelves were convinced of the ſhort duration of the golden age of their language. According to the moſt judicious critics, it commenced with the era of Cicero's oratorical productions, and terminated with the reign of Tiberius, or perhaps it did not reach beyond the middle of that prince's reign. It is generally believed that eloquence, and with it every thing liberal, elevated, and manly, was baniſhed Rome by the deſpotiſm of the Cæſars. We imagine that the tranſition was too inſtantaneous to have been entirely produced by that unhappy cauſe. Deſpotiſm was firmly eſtabliſhed among the Romans about the middle of the reign of Auguſtus; and yet that period produced ſuch a group of learned men as never adorned any other nation in ſo ſhort a ſpace of time. Deſpotiſm, we acknowledge, might have affected the eloquence of the bar; the noble and important objects which had animated the republican orators being now no more: but this circumſtance could not affect poetry, hiſtory, philoſophy, &c. The ſtyle employed upon theſe ſubjects did not feel the fetters of deſpotiſm. The age of Louis XIV. was the golden period

197 Cauſes of the degeneracy of the Latin tongue.

(A) This treaty, according to the ſame hiſtorian, was concluded in the conſulſhip of Lucius Junius Brutus and Marcus Valerius, 28 years before Xerxes made his deſcent upon Greece.

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riod of the French tongue; and we think that age produced a race of learned men, in every department superior in number and equal in genius to the literati who flourished under the noble and envied constitution of Britain during the same age, though the latter is universally allowed to have been the golden period of this country. The British isles, we hope, enjoy still as much liberty as ever; yet we believe few people will aver, that the writers of the present age are equal either in style or in genius to that noble group who flourished from the middle of the reign of Charles I. to the middle of the reign of George II.; and here despotism is quite unconcerned.

In the east the same observation is confirmed. The Persians have long groaned under the Mohammedan yoke; and yet every oriental scholar will allow, that in that country, and under the most galling tyranny, the most amazing productions of taste, genius, and industry, that ever dignified human nature, have been exhibited. Under the Arabian caliphs, the successors of Mohammed, appeared writers of a most sublime genius, though never was despotism more cruelly exercised than under those fanatics. The revival of letters at the era of the Reformation was chiefly promoted and cherished by petty despotical princes.

We cannot therefore be persuaded, that the despotism of the Cæsars banished eloquence and learning from Rome. Longinus indeed has attributed this misfortune to that cause, and tells us, θρεψαι τε γαρ ικανη τα φρονηματα των μεγαλοφρονων ἡ ΕΛΕΥΘΕΡΙΑ, &c. "It is liberty that is formed to nurse the sentiments of great geniuses, to push forward the propensity of contest, to inspire them with hopes, and the generous ambition of being the first in rank." When Longinus wrote this, he did not reflect that he himself was a striking instance of the unsoundness of his observation.

103
The writers of the silver age greater masters of science than their predecessors.

As to science, the fact is undoubtedly on the other side. That Seneca was superior to Cicero in philosophy, cannot be reasonably contradicted. The latter had read, and actually abridged, the whole extent of Grecian philosophy: this displayed his reading rather than his learning. The former had addicted himself to the stoic sect; and though he does not write with the same flow of eloquence as Tully, he thinks more deeply and reasons more closely. Pliny's Natural History is a wonderful collection, and contains more useful knowledge than all the writings of the Augustan age condensed into one mass. We think the historical annals of Tacitus, if inferior to Livy in style and majesty of diction, much superior in arrangement and vigour of composition. In short, we discover in these productions a deep insight into human nature, an extensive knowledge of the science of government, a penetration which no dissimulation could escape, together with a sincere attachment to truth both with respect to events and characters; nor is he inferior in the majesty, energy, and propriety of his harangues, wherever an equal opportunity presents itself. Quintilian, Pliny the younger, Suetonius, Petronius Arbiter, and Juvenal, deserve high esteem; nor are they inferior to their immediate predecessors. We think there is good reason to conclude, that the loss of liberty among the Romans did not produce the extinction of eloquence, science, elevation of sentiment, or refinement of taste. There were, we believe, other circumstances which chiefly contributed to produce that revolution.

The same Velleius Paterculus whom we have quoted assigns some plausible and very judicious reasons for this catastrophe. "Emulation (says he) is the nurse of genius; and one while envy, and another admiration, fires imitation. According to the laws of nature, that which is pursued with the greatest ardour mounts to the top: but to be stationary in perfection is a difficult matter; and by the same analogy, that which cannot go forward goes backward. As at the outset we are animated to overtake those whom we deem before us, so when we despair of being able to overtake or to pass by them, our ardour languishes together with our hope, and what it cannot overtake it ceases to pursue; and leaving the subject as already engrossed by another, it looks out for a new one upon which to exert itself. That by which we find we are not able to acquire eminence we relinquish, and try to find out some object *elsewhere* upon which to employ our intellectual powers. The consequence is, that frequent and variable transitions from subject to subject proves a very great obstacle to perfection in any profession."

This perhaps was the case with the Romans. The heroes of the Augustan age had borne away the prize of eloquence, of history, of poetry, &c. Their successors despaired of being able to equal, much less to surpass them, in any of these walks. They were therefore laid under the necessity of striking out a new path by which they might arrive at eminence. Consequently Seneca introduced the *stile coupé*, as the French call it; that is, a short, sparkling, figurative diction, abounding with antitheses, quaintnesses, witticisms, embellished with flowers and meretricious ornaments; whereas the style of the Augustan age was natural, simple, solid, unaffected, and properly adapted to the nature of the subject and the sentiments of the author.

The historian Sallust laid the foundation of the unnatural style above mentioned. Notwithstanding all the excellencies of that celebrated author, he everywhere exhibits an affectation of antiquity, an antithetical cast, an air of austerity, an accuracy, exactness, and regularity, contrary to that *air degagé* which nature displays in her most elaborate efforts. His words, his clauses, seem to be adjusted exactly according to number, weight, and measure, without excess or defect. Velleius Paterculus imitated this writer; and, as is generally the case with imitators, succeeded best in those points where his archetype had failed most egregiously. Tacitus, however excellent in other respects, deviated from the Augustan exemplars, and is thought to have imitated Sallust; but affecting brevity to excess, he often falls into obscurity. The other contemporary writers employ a cognate style; and because they have deviated from the Augustan standard, their works are held in less estimation, and are thought to bear about them marks of degeneracy.

That degeneracy, however, did not spring from the despotic government under which these authors lived, but from that affectation of singularity into which they were led by an eager but fruitless desire of signalizing themselves in their mode, as their predecessors had done in theirs. But the mischiefs of this rage for innovation did not reach their sentiments, as it had done their

style;

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ftyle; for in that point we think they were fo far from falling below the meafure of the writers of the former age, that in many inftances they feem to have furpaffed them.

With refpect to fentiment and mental exertions, the authors in queftion preferved their vigour, till luxury and effeminacy, in confequence of power and opulence, enervated both the bodies and minds of the Romans. The contagion foon became univerfal; and a liftleffnefs, or intellectual torpor, the ufual concomitant of luxury, fpread indolence over the mental faculties, which rendered them not only averfe to, but even incapable of, induftry and perfeverance. This lethargic difpofition of mind feems to have commenced towards the conclufion of the filver age; that is, about the end of the reign of Adrian. It was then that the Roman eagle began to ftoop, and the genius of Rome, as well in arts as in arms, began to decline. Once more, the declenfion of the intellectual powers of the writers of that nation did not arife from the form of the government, but from the caufes above fpecified.

As the Roman genius, about that period, began to decline, fo the ftyle of the filver age was gradually vitiated with barbarifms and exotic forms of fpeech. The multitudes of barbarians who flocked to Rome from all parts of the empire; the ambaffadors of foreign princes, and often the princes themfelves, with their attendants; the prodigious numbers of flaves who were entertained in all the confiderable families of the capital, and over all Italy; the frequent commerce which the Roman armies upon the frontiers carried on with the barbarians; all concurred to vitiate the Latin tongue, and to interlard it with foreign words and idioms. In fuch circumftances, it was impoffible for that or any other language to have continued pure and untainted.

This vitiated character both of ftyle and fentiment became more and more prevalent, in proportion as it defcended from the reign of Adrian towards the era of the removal of the imperial feat from Rome to Conftantinople. Then fucceeded the iron age, when the Roman language became abfolutely rude and barbarous.

199 Writers of great talents during the filver and brazen ages.

Towards the clofe of the filver, and during the whole courfe of the brazen age, there appeared, however, many writers of no contemptible talents. The moft remarkable was Seneca the ftoic, the mafter of Nero, whofe character both as a man and a writer is difcuffed with great accuracy by the noble author of the *Characteriftics*, to whom we refer our readers.

About the fame time lived Perfius the fatirift, the friend and difciple of the ftoic Cornutus; to whofe precepts he did honour by his virtuous life; and by his works, though fmall, he fhowed an early proficiency in the fcience of morals.

Under the mild government of Adrian and the Antonines lived Aulus Gellius, or (as fome call him) Agellius; an entertaining writer in the mifcellaneous way, well fkilled in criticifm and antiquity. His works contain feveral valuable fragments of philofophy, which are indeed the moft curious part of them.

With Aulus Gellius we may rank Macrobius; not becaufe he was a contemporary (for he is fuppofed to have lived under Honorius and Theodofius), but from his near refemblance in the character of a writer. His works, like thofe of the other, are mifcellaneous; filled with mythology and ancient literature, with fome philofophy intermixed.

In the fame age with Aulus Gellius flourifhed Apuleius of Madaura in Africa; a Platonic writer, whofe matter in general far exceeds his perplexed and affected ftyle, too conformable to the falfe rhetoric of the age in which he lived.

Boethius was defcended from one of the nobleft of the Roman families, and was conful in the beginning of the fixth century. He wrote many philofophical works; but his ethic piece on the Confolation of Philofophy deferves great encomiums, both for the matter and the ftyle; in which latter he approaches the purity of a far better age than his own. By command of Theodoric king of the Goths this great and good man fuffered death; and with him the Latin tongue, and the laft remains of Roman dignity, may be faid to have funk in the weftern world.

There were befides a goodly number both of poets and hiftorians who flourifhed during this period; fuch as Silius Italicus, Claudian, Aufonius, &c. poets and hiftorians to a very great number, for whom our readers may confult *Joh. Alberti Fabricii Bibl. Lat.*

200 Elegant ecclefiaftical writers in Latin.

There flourifhed, too, a number of ecclefiaftical writers, fome of whom deferve great commendation. The chief of thefe is Lactantius, who has been defervedly dignified with the title of the *Chriftian Cicero.*

The Roman authors amount to a very fmall number in comparifon of the Greek. At the fame time, when we confider the extent and duration of the Roman empire, we are juftly furprifed to find fo few writers of character and reputation in fo vaft a field. We think we have good reafon to agree with the prince of Roman poets in the fentiment already quoted.

201 Excellency and ufefulnefs of the Latin tongue.

Upon the whole, the Latin tongue deferves our attention beyond any other ancient one now extant. The grandeur of the people by whom it was fpoken; the luftre of its writers; the empire which it ftill maintains among ourfelves; the neceffity we are under of learning it in order to obtain accefs to almoft all the fciences, nay even to the knowledge of our own laws, of our judicial proceedings, of our charters; all thofe circumftances, and many others too numerous to be detailed, render the acquifition of that imperial language in a peculiar manner at once improving and highly interefting. Spoken by the conquerors of the ancient nations, it partakes of all their revolutions, and bears continually their impreffion. Strong and nervous while they were employed in nothing but battles and carnage, it thundered in the camps, and made the proudeft people to tremble, and the moft defpotic monarchs to bend their ftubborn necks to the yoke. Copious and majeftic, when, weary of battles, the Romans inclined to vie with the Greeks in fcience and the graces, it became the learned language of Europe, and by its luftre made the jargon of favages difappear who difputed with it the poffeffion of that quarter of the globe. After having controuled by its eloquence, and humanized by its laws, all thofe people, it became the language of religion. In fhort, the Latin language will be ftudied and efteemed as long as good fenfe and fine tafte remain in the world.

SECT.

Sect. IX. *Celtic, Gothic, and Sclavonian Languages.*

§ 1. *Of the Celtic Language.*

In treating of the origin of the Latin tongue (ſee Sect. VIII.), we obſerved that a great part of it is derived from the Celtic. We ſhall now endeavour to give ſome account of the origin and extent of that ancient language; ſtill leaving the minutiæ to grammars and dictionaries, as we have done with reſpect to the other dialects which have fallen under our conſideration. Our candid readers, it is hoped, will remember, that we are acting in the character of philologers, not in that of grammarians and lexicographers.

202 Origin of the Celts. The deſcendants of Japhet having peopled the weſtern parts of Aſia, at length entered Europe. Some broke into that quarter of the globe by the north, others found means to croſs the Danube near its mouth. Their poſterity gradually aſcended towards the ſource of that river; afterwards they advanced to the banks of the Rhine, which they paſſed, and thence ſpread themſelves as far as the Alps and the Pyrenees.

Theſe people, in all probability, were compoſed of different families; all, however, ſpoke the ſame language; their manners and cuſtoms bore a near reſemblance; there was no variety among them but that difference which climate always introduces. Accordingly they were all known, in the more early times, by the general name of *Celto-ſcythæ*. In proceſs of time, becoming exceedingly numerous, they were divided into ſeveral nations, which were diſtinguiſhed by different names and territorial appellations. Thoſe who inhabited that large country bounded by the ocean, the Mediterranean, the Rhine, the Alps, and the Pyrenees, were

203 part of whom were denominated Gauls. denominated *Gauls* or *Celts*. Theſe people multiplied ſo prodigiouſly in the ſpace of a few centuries, that the fertile regions which they then occupied could not afford them the means of ſubſiſtence. Some of them now paſſed over into Britain; others croſſed the Pyrenees, and formed ſettlements in the northern parts of Spain. Even the formidable barriers of the Alps could not impede the progreſs of the Gauls: they made their way into Italy, and colonized thoſe parts which lie at the foot of the mountains; whence they extended themſelves towards the centre of that rich country.

By this time the Greeks had landed on the eaſtern coaſt of Italy, and founded numerous colonies in thoſe parts. The two nations vying as it were with each other in populouſneſs, and always planting colonies in the courſe of their progreſs, at length rencountered about the middle of the country. This central region was at that time called *Latium*. Here the two nations formed one ſociety, which was called *the Latin people*. The languages of the two nations were blended together; and hence, according to ſome, the Latin is a mixture of Greek and Gaelic.

As the Gauls were a brave and numerous people, they certainly maintained themſelves in their priſtine poſſeſſions, uninvaded, unconquered, till their civil animoſities and domeſtic quarrels expoſed them as a prey to thoſe very Romans whom they had ſo often defeated, and ſometimes driven to the brink of deſtruction. They were not a people addicted to commerce; and, upon the whole, conſidering their ſituation both in their primary ſeats and afterwards in Italy, they had little temptation or opportunity to mingle with foreigners. Their language, therefore, muſt have remained unmixed with foreign idioms. Such as it was when they ſettled in Gaul, ſuch it muſt have continued till the Roman conqueſts. If therefore there is one primitive language now exiſting, it muſt be found in the remains of the Gaelic or Celtic. It is not, then, ſurpriſing, that ſome very learned men, upon diſcovering the coincidence of very great numbers of words in ſome of the Greek dialects with other words in the Celtic, have been inclined to eſtabliſh a ſtrict affinity between thoſe languages. The ancient Pelaſgic and the Celtic at leaſt muſt have nearly reſembled each other, admitting a dialectical difference only, and that diſcrimination which climate and a long period of time muſt always produce. 204 Reſemblance between their language and that of the Pelaſgi.

Some have thought that the Gauls loſt the uſe of their native language ſoon after their country was conquered by the Romans; but *Monſieur Bullet*, in his *Memoires de la Langue Celtique*, has proved almoſt to a demonſtration, that the vulgar among thoſe people continued to ſpeak it ſeveral centuries after that period. When a great and populous nation has for many ages employed a vernacular tongue, nothing can ever make them entirely relinquiſh the uſe of it, and adopt unmixed that of their conquerors.

Many learned men, among whom is the lexicographer above mentioned, have ſhown that all the local names in the north of Italy are actually of Celtic extraction. Theſe names generally point out or deſcribe ſome circumſtances relating to the nature of their ſituation: ſuch as expoſure, eminence, lowneſs, moiſtneſs, dryneſs, coldneſs, heat, &c. This is a very characteriſtic feature of an original language; and in the Celtic it is ſo prominent, that the Erſe names of places all over Scotland are, even to this day, peculiarly diſtinguiſhed by this quality. We have heard a gentleman, who was well ſkilled in the dialect of the Celtic ſtill ſpoken in the Highlands of Scotland, propoſe to lay a bet, at very great odds, that if one ſhould pronounce the name of any village, mountain, river, gentleman's ſeat, &c. in the old Scottiſh dialect, he ſhould be able, by its very name, to give a pretty exact deſcription of its local ſituation.

To diſcover the ſources from which the Celtic tongue is derived, we muſt have recourſe to the following expedients.

1. We muſt conſult the Greek and Latin authors, who have preſerved ſome Gaelic or Celtic terms in their writings.

2. We muſt have recourſe to the Welſh and *Baſſe Bretagne* dialects; in which, indeed, there are many new words, but theſe are eaſily diſtinguiſhed from the primitive ſtock.

3. If one would trace another ſource of the Celtic, he muſt converſe with the country people and peaſants, who live at a diſtance from cities, in thoſe countries where it was once the vernacular tongue. We have been credibly informed, that a Highland gentleman croſſing the Alps for Italy, accidentally fell in with an old woman, a native of thoſe parts, who ſpoke a language ſo near akin to his native Erſe, that he could underſtand her with little difficulty; and that ſhe, on the other hand, underſtood moſt of his words. That an event of this nature ſhould actually take place is by no

means surprising, when we consider that the Erse spoken in the Highlands of Scotland is perhaps the most genuine remnant of the Celtic now existing, and at the same time reflect that there may be some remote cantons among those wild and inaccessible mountains, the Alps, where some remains of that tongue may still be preserved.

205 The most genuine remains of the Celtic in the Highlands of Scotland.

4. We have said that the most genuine remains of the Gaelic tongue are to be found in the Highlands of Scotland; and the reason is obvious. The Scottish Highlanders are the unmixed unconquered posterity of the ancient Britons, into whose barren domains the Romans never penetrated; not, we imagine, because they were not able, since they subdued both North and South Wales, equally inaccessible, but because they found no scenes there either to fire their ambition or allure their avarice. Amidst all the revolutions that from time to time shook and convulsed Albion, those mountainous regions were left to their primitive lords, who, like their southern progenitors, hospitable in the extreme, did not, however, suffer strangers to reside long among them. Their language, accordingly, remained unmixed, and continues so even unto this day, especially in the most remote parts and unfrequented islands.

The Norwegians subdued the western islands of Scotland, at a time when the Scottish monarchy was still in its minority. They erected a kind of principality over them, of which the isle of Man was the capital. Though they maintained the sovereignty of those islands for some centuries, built many forts, and strengthened them with garrisons, and in fine were the lawgivers and administrators of justice among the natives; yet we have been informed by the most respectable authority, that there is not at this day a single vocable of the Norse or Danish tongue to be found among these islanders. This fact affords a demonstration of that superstitious attachment with which they were devoted to their vernacular dialects.

206 The Welsh dialect not pure, nor the Irish.

The Welsh dialect cannot, we think, be pure and unsophisticated. The Silures were conquered by the Romans, to whom they were actually subject for the space of three centuries. During this period a multitude of Italian exotics must have been transplanted into their language; and indeed many of them are discernible at this day. Their long commerce with their English neighbours and conquerors hath adulterated their language, so that a great part of it is now of an English complexion. The Irish is now spoken by a race of people whose morality and ingenuity is nearly upon a level. Their latest historians have brought them from the confines of Asia, through a variety of adventures, to people an island *extra anni solisque vias*. However this genealogical tale may please the people for whom it was fabricated, we must still suspect that the Irish are of Celtic extraction, and that their forefathers emigrated from the western coast of Britain at a period prior to all historical or even traditional annals. Ireland was once the *native land of saints*. The chief actors on this sacred stage were Romanists, and deeply tinctured with the superstition of the times. They pretended to improve the language of the natives; and whatever their success was, they improved it in such a manner as to make it deviate very considerably from the original Celtic; so that it is not in Ireland that we are to look for the genuine characters of the dialect under consideration.

207 Coincidence between the Celtic and Phoenician.

Though the Hibernian tongue, in our opinion, differs considerably from the original Celtic, some very ingenious essays have been lately published by the learned and laborious members of the *Antiquarian Society of Dublin*; in which the coincidence of that tongue with some of the oriental dialects, has been supported by very plausible arguments. In a dissertation published in the year 1772, they have exhibited a collection of *Punico-Maltese* words compared with words of the same import in Irish, where it must be allowed the resemblance is palpable. In the same dissertation they have compared the celebrated *Punic* scene in Plautus with its translation into the Irish; in which the words in the two languages are surprisingly similar. If those criticisms are well founded, they will prove that the Celtic is coeval and congenial with the most ancient languages of the east; which we think highly probable. Be that as it may, the Danes and Norwegians formed settlements in Ireland; and the English have long been sovereigns of that island. These circumstances must have affected the vernacular idiom of the natives; not to mention the necessity of adopting the language of the conquerors in law, in sciences, in the offices of religion.

The inhabitants of the highlands and islands of Scotland are the descendants of those Britons who fled from the power of the Romans, and sheltered themselves among the fens, rocks, and fastnesses of those rugged mountains and sequestered glens. They preferred those wastes and wilds, with liberty and independence, to the pleasant and fertile valleys of the south, with plenty embittered by slavery. They no doubt carried their language along with them; that language was a branch of the Celtic. With them, no doubt, fled a number of the druidical priests, who unquestionably knew their native dialect in all its beauties and varieties. These fugitives in process of time formed a regular government, elected a king, and became a considerable state. They were sequestered by their situation from the rest of the world. Without commerce, without agriculture, without the mechanical arts, and without objects of ambition or emulation, they addicted themselves wholely to the pastoral life as their business, and to hunting and fishing as their diversion. Those people were not distinguished by an innovating genius; and consequently their language must have remained in the same state in which they received it from their ancestors. They received it genuine *Celtic*, and such they preserved it.

When the Scots became masters of the low country, and their kings and a great part of the nobility embraced the Saxon manners, and adopted the Saxon language, the genuine Caledonians tenaciously retained their native tongue, dress, manners, clanships, and feudal customs, and could never cordially assimilate with their southern neighbours. Their language, therefore, could not be polluted with words or idioms borrowed from a people whom they hated and despised. Indeed it is plain from the whole tenor of the Scottish history, that neither Caledonian chieftains, nor their vassals, were ever steadily attached to the royal family after they fixed their residence in the low country, and became *Saxons*, as the Highlanders called them by way of reproach. Indeed the commerce between them and those of the south, till about a century and a half ago, was only transient

and

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and accidental; nor was their native dialect in the least affected by it.

208
Causes of the purity of the Scotch dialect of this ancient language.

Their language, however, did not degenerate, because there existed among them a description of men whose profession obliged them to guard against that misfortune. Every chieftain retained in his family a bard or poet laureat, whose province it was to compose poems in honour of his lord, to commemorate the glorious exploits of his ancestors, to record the genealogy and connections of the family; in a word, to amuse and entertain the chief and his guests at all public entertainments and upon all solemn occasions. Those professors of the Parnassian art used to vie with each other; and the chiefs of families often assembled their respective bards, and encouraged them by considerable premiums to exert their poetic talents. The victor was rewarded and honoured; and the chieftain deemed it an honour to himself to entertain a bard who excelled his peers. The ancient Gauls, as we learn from Diodorus Siculus, Strabo, Tacitus, Lucan, &c. entertained persons of that profession; and certainly the ancient Britons did the same. Those bards were highly revered; their persons were deemed sacred; and they were always rewarded with salaries in lands or cattle (see Section *Greek*). Those poetic geniuses must have watched over their vernacular dialect with the greatest care and anxiety; because in their compositions no word was to be lost, but as many gained as possible.

The use of letters was not known among the ancient *Celtæ*; their druidical clergy forbade the use of them. All their religious rites, their philosophical dogmas, their moral precepts, and their political maxims, were composed in verses which their pupils were obliged to commit to memory. Accordingly letters were unknown to the Caledonian Scots, till they learned them either from their southern neighbours or from the Romans. The Irish, indeed, pretend to have letters of a very ancient date; the Highlanders of the country in question make no claim to the use of that invention. Their bards, therefore, committed every thing to memory; and of course the words of their language must have been faithfully preserved. We find that the celebrated poems of Ossian, and others of an inferior character, or at least fragments of such poems (see OSSIAN), have thus been preserved from father to son for more than 1000 years. The beauty, significancy, harmony, variety, and energy of these verses, strike us even in a prose translation: how infinitely more charming must they appear in their native form and poetical attire!

In order to exhibit the genius of the Celtic in as striking a light as the nature of our present design will permit, we shall lay before our readers a very contracted sketch of the Gaelic or Caledonian dialect as it now stands; which we hope will go a great way to convince them that this is the genuine offspring of the other. In doing this we shall borrow many hints from a gentleman* whose learning seems to equal his zeal for his native language; which, in compliance with the modern practice, we shall for the future distinguish by the name of *Gaelic*.

* Essays, &c. by James Grant, Esq. advocate.

The Gaelic is not derived from any other language as far as we know, being obviously reducible to its own roots. Its combinations are formed of simple words of a known signification; and those words are resolvable into the simplest combinations of vowels and consonants, and even into simple sounds. In such a language we may expect that some traces will be found of the ideas and notions of mankind living in a state of primeval simplicity; and if so, a monument is still preserved of the primitive manners of the Celtic race while as yet under the guidance of simple nature, without any artificial restraint or controul.

The sudden sensations of heat and cold, and bodily pain, are expressed by articulate sounds, which, however, are not used in this language to denote heat, cold, or bodily pain. A sudden sensation of heat is denoted by an articulate exclamation *hait*; of cold, by *id*; of bodily pain, by *aich*. All these sounds may be called *interjections*, being parts of speech which discover the mind to be seized with some passion. Few of the improved languages of Europe present so great a variety of sounds which instantaneously convey notice of a particular passion, bodily or mental feeling.

The pronouns *he* and *she* are expressed by the simple sounds *e* and *i*, and these are the marks of the masculine and feminine genders; for a neuter gender is unknown in the *Gaelic*. The compositions of rude and barbarous ages are universally found to approach to the style and numbers of poetry; and this too is a distinguishing character of the *Gaelic*. Bodily subsistence will always be the principal concern of an uncultivated people. Hence *ed* or *eid* is used upon discovery of any animal of prey or game: it is meant to give notice to the hunting companion to be in readiness to seize the animal: and hence we believe *edo* "to eat" in Latin, and *ed* in Irish, signifies "cattle;" likewise in Scotch *edal* "cattle," literally signifies "the offspring or generation of cattle." *Coed* or *cued*, "share or portion of any subject of property," literally "common food." *Faod* "hunting," literally "gathering of food." *Edra* "the time of the morning when cattle are brought home from pasture to give milk," literally "meal-time." These are words importing the simplicity of a primitive state, and are common in the Gaelic idiom.

Traces of imitative language remain in all countries. The word used for *cow* in the Gaelic language is *bo*, plainly in imitation of the lowing of that animal.

In joining together original roots in the progress of improving language and rendering it more copious, its combinations discover an admirable justness and precision of thought, which one would scarce expect to find in an uncultivated dialect. It will, however, be found, upon examination, that the Gaelic language, in its combination of words, specifies with accuracy the known qualities, and expresses with precision the nature and properties which were attributed to the object denominated.

209
Excellency of Gaelic compounds.

An appears to have been a word of frequent use in this language, and seems to have been originally a name applied indefinitely to any object. According to Bullet, it was used to signify "a planet;" hence the *sun* had the name of *grian*, which is a compound of *gri* "hot," and *an* "a planet." *Re* signifies originally and radically "division." The changes of the moon and the variety of her phases were early employed to point out the divisions of time. The present name for the *moon* is *geulach*; a word derived from her whiteness of colour. To these we might add a vast number more whose signification precisely indicates their shape, colour, effects, &c. Many of these would be found exactly similar to Greek.

Celtic Language. Greek and Latin words of the ſame ſound and ſignification. In order to ſatisfy our curious readers, we ſhall annex a few, though ſome of them may perhaps be queſtionable.

The *Venus* of the Latins is ſaid to be a compound of *ben* and *jus*, which literally ſignify "the firſt woman," the letter *b* in Gaelic being ſoftened into *v*. Εδαρ and ειδαρ ſignify "food." Theſe words are compounded of the Gaelic words *ed* or *eid* and *ar*; the former denotes *food* ſimply, and the latter *ploughed land*. Theſe are the roots of the Greek and Latin words ἐδω, *edo*; αρεω, *aro*. Εδρα, which ſignifies "a ſeat," has an evident reference to food. It is compounded of two Gaelic words *ed* and *ira*, which literally ſignifies "meal-time." Εδνα, which ſignifies "the preſents which a bridegroom made to his bride," is a compound of two Gaelic words *ed* and *na* or *nuah*, literally ſignifying "raw food." From *ar* there are many Greek derivatives. Αρȣρα ſignifies "ploughed land," alſo "crop of corn;" Αρτος, "bread." In Gaelic *a crop of corn* and *bread* are expreſſed by *arbhar*, commonly pronounced *arar* and *aran*; all being equally derivatives of the root *ar*. So the Greek and Latin words αροτος, *arabilis*, "arable;" αροτρον, *aratrum*, "a plough;" αροτης, *arator*, "a ploughman;" and many others, are evidently derived from the ſame ſource. We would not, however, ſuggeſt, in conſequence of this coincidence, that either the Greek or Latin languages was derived from the Gaelic; we rather believe that theſe are remains of a primeval tongue, which are ſtill retained in all the three; and we produce them upon the preſent occaſion as preſumptions that the Gaelic is an original, underived language, and of courſe the moſt pure and unadulterated relick of the Celtic now exiſting. If our readers ſhould incline to know more of this ſubject, they may conſult Pezron's *Origin of Ancient Nations*, Bullet's *Mem. de la Langue Celtique*, Parſon's *Rem. of Japhet*, Gebelin's *Monde prim*, &c.

210 Copiouſneſs and antiquity of the Celtic.

When the Celtic language was generally ſpoken over Europe, it ſeems to have been amazingly copious. By conſulting Bullet's *Memoires*, it appears that its names for the common and various objects of nature were very numerous. The words denoting water, river, wood, foreſt, mountain, lake, &c. were moſt preciſely accommodated to ſpecify each modification and variety, with ſuch peculiar exactneſs as even the Greek, with all its boaſted idiomatical preciſion and copiouſneſs, has not been able to equal. The appearances which diverſify the viſible face of inanimate nature, arreſt the attention of men in an uncultivated ſtate. Unaccuſtomed to thought and abſtract reaſoning, their minds expand and exerciſe their powers upon ſenſible objects, and of courſe mark every *minutia* and almoſt imperceptible diſtinction with an accuracy to us ſeemingly impoſſible.

We hope it now appears to every reader, that the Celtic was one of the dialects of the primitive language; that it once overſpread by far the greateſt part of Europe; that the Gaelic now ſpoken in the northern parts of Scotland and the adjacent iſlands is the moſt pure and unmixed relick of that tongue now anywhere exiſting. We would willingly refer our readers to ſome well compoſed grammar of that language; but indeed we know of none that deſerves our recommendation. Some years ago we were flattered with the proſpect of ſeeing one publiſhed by a gentleman whoſe deep ſkill in that language is univerſally acknowledged. We have likewiſe heard of an intended dictionary of the ſame tongue; but hitherto our hopes have been diſappointed. Celtic Language.

We are, however, happy to find that there is now publiſhing an excellent tranſlation of both the Old and New Teſtaments into Gaelic, which has hitherto been a deſideratum among thoſe who ſpeak this language. Such a tranſlation will at once contribute to preſerve that ancient tongue, and diſſeminate the knowledge of the truth among the natives of that country.

Every aſſiſtance towards acquiring the knowledge of a tongue which was once univerſal over a great part of Europe, will certainly be an acceptable preſent to the public. The antiquary, who is deſirous of tracing the affinity of languages, and wiſhes to mark the migrations of people, ought certainly to apply himſelf to the ſtudy of its remaining branches; and, if we miſtake not, he will ſoon be convinced, that they all breathe a ſpirit congenial to the manners and ſentiments of a people who are juſt entering upon the firſt ſtage of improvement and civilization.

Perhaps it may be expected, that, before we conclude this ſhort ſketch of the Celtic tongue, we ſhould give ſome account of the origin of the words *Gaul* and *Gal*, the two names by which this people was diſtinguiſhed by the Greeks and Romans. 211 Origin of the words Gaul and Gal. Mr M'Pherſon imagines, that the appellation of *Celt* is an adjective derived from *Gael*, the aboriginal name of the inhabitants of ancient Gaul. For our part, we can ſee no connection between *Gael* and *Kelt*, nor do we think that the latter is an adjective. We believe that thoſe people called themſelves *Cael* and not *Gael*. We are ſure that *Caledonia*, or *Cal-dòn* or *dun*, was an ancient name of the mountainous parts of Scotland.

Though many different opinions have been advanced with relation to the etymology of this word, we imagine that none is ſo probable as that which ſuppoſes that it is compounded of the two Celtic words *Cal* or *Kal*, that is, "Gal or Gaul," and *dun*, which ſignifies "a hill or mountain." Upon this ground, the Caledonii will import the Gauls of the mountains, or, which is the ſame, the Highland Gauls. The Iriſh and Highlanders reciprocally denominate themſelves by the general title of *Cael*, *Gael*, or *Gauls*. They alſo diſtinguiſh themſelves, as the Welch originally did, and as the Welch diſtinguiſh them both at preſent, by the appellation of *Guidhill*, *Guethel*, and *Gathel*. The intermediate *th*, they ſay, is left quieſcent in the pronunciation, as it is in many words of the Britiſh language; in which caſe *Gathel* would immediately be formed into *Gael*; and Gathel is actually ſounded like *Gael* by both the Iriſh and Highlanders at preſent. The appellation of *Gathel*, therefore, ſay they, was originally the ſame with *Gael*, and the parent of it. The quieſcent letters in Britiſh are frequently transferred from the middle to the concluſion of the word; by which manœuvre, *Gathel* is changed into *Galath*, *Galat*, *Galt*, and *Celt*. It is true, that *Gael* of the continent is univerſally denominated *Galatæ* and *Celtæ* by the Grecians, and *Galli* and *Gallia* by the Iriſh. The appellations, therefore, of *Gathel i*, *Gall-i*, *Gallat-æ*, *Calet-es*, *An-calit-es*, and *Celt-æ*, are all one and the ſame denomination, only varied by the aſtoniſhing ductility of the *Celtic*, and diſguiſed by the alterations ever incident to a language that has been merely oral for ages.

It may perhaps appear preſumptuous in us to differ

Celtic Language. fer from two such respectable authorities as M'Pherson and Whitaker: we must, however, acknowledge, that neither the one nor the other appears to us well founded. Besides, they convey no idea of the signification of the words, though in the Celtic language they must have been significant. The name *Gael*, the same with *Gal*, was probably given them in the East from the Greek καλ, which in many oriental languages denotes *fair;* and γαλατια may be easily derived from γαλ or γαλαθ, *Gal* or *Galath*.—This denomination might be given them by their neighbours, in allusion to their fair complexion.

§ 2. *Of the Gothic Language.*

212 Ancient Gothic. THE Celtic and Gothic tongues at one time divided Europe between them. Both were of equal antiquity, both originated in Asia, both were dialects of the original language of mankind. The Celtic, however, was first imported into Europe. The Gauls or Celts had penetrated farthest towards the west; a circumstance which plainly intimates the priority of their arrival. In the population of countries, we believe it may be held as a maxim, that the colonies who emigrated first were generally impelled by succeeding emigrants; and that of consequence the most early were pushed forward to the parts most distant. The Celts, then, having overspread the most western parts of Europe, must have arrived more early in those regions.

The Goths and Getæ were the same race of people, according to Procopius *, *de bello Goth.;* and Strabo † (B) informs us, that they spoke the same language with the Thracians, from whose confines they had spread themselves northward as far as the western banks of the Danube. Vopiscus, in the History of Probus, tells us, that this emperor ‡ obliged "the Thracians, and all the Getic tribes, either to surrender or accept of his friendship." This expression indicates, that the Thracians and the Getic tribes were deemed the same race of people. From this deduction it is clear, that the Getæ and Thracians were brethren; that they spoke the same language: and that their laws, manners, customs, and religious tenets, were the same, might easily be shown, were this a proper place for an inquiry of that nature.

* Lib. i. cap. 2.
† Lib. ii. cap. 23.
213 The same with the language of the Thracians.
‡ Lib. 7.

The Thracian language, as might be demonstrated from names of persons, offices, places, and customs, among that people, was nearly related to the Chaldean and other oriental languages.

214 Origin of the Goths. They are thought to have been the descendants of Tiras, one of the sons of Japhet, and consequently must have preserved the speech of the Noachic family. The Gothic language abounds with *Pahlavi*, or old Persic words, which are no doubt remains of the primeval dialect of mankind. The Thracians peopled a considerable part of the northern coast of Asia Minor; and consequently we meet with many names of cities, mountains, rivers, &c. in those parts, exactly corresponding with many names in Europe, evidently imposed by our Gothic progenitors. Any person tolerably acquainted with the remains of the Gothic tongue, will be able to trace these with little difficulty. Gothic Language.

We learn from Herodotus *, that Darius in his expedition against the wandering Scythians who lived on the other side of the Ister or Danube, in his progress subdued the Getæ; and in the same passage the historian informs us, that these people held the immortality of the human soul, and that they were the bravest and most just of all the Thracians. After this period, we find them mentioned by almost every Greek writer, even familiarly; for Geta, in the comedies of that nation, is a common name for a slave. The Getæ then occupied all that large tract of country which extended from the confines of Thrace to the banks of the Danube; were a brave and virtuous people; and spoke the same language with the Thracians, with whom they are often confounded both by Greek and Roman historians.

* Lib. iv. *passim.*

But the name of *Goths* is by no means so ancient. It was utterly unknown both to the ancient Greeks and Romans. The first time that the name *Goth* is mentioned is in the reign of the emperor Decius, about the year of Christ 250. About that time they burst out of Getia, and, rushing like a torrent into the empire, laid waste every thing with fire and sword. The name of their leader or king was *Cneva*. Decius, endeavouring to expel them from Thrace, was vanquished and slain.

After this irruption, we find them frequently in the Latin authors under the name of *Getæ* or *Gothi;* though the Greeks generally denominate them *Scythæ*. Torfæus tells us, that *get* ‖ and *got* are actually the same word, which anciently, according to him, denoted a "soldier." *Got* in Icelandic signifies a "horse or horseman," and *gatu* a "wanderer;" and this last was perhaps the import of the term *Getæ*, they being originally an unsettled vagrant people. As nations generally assume to themselves some high auspicious denomination, we may believe the Goths did the same. We may therefore rest satisfied, that the Getæ assumed the Icelandic name above mentioned as their national one: or perhaps, notwithstanding their Greek denomination, they called themselves *Gots* or *Goths* from the beginning.

‖ *History of Norway,* lib. i.

The original seat of the Goths was the country now called *Little Tartary*, into which they had extended themselves from the frontiers of Thrace. This country was called *Little Scythia* by the Greek writers; and it was the station whence those innumerable swarms advanced, which, in conjunction with the Alani and other barbarous tribes, at length overran and subverted the western empire. One part of the Gothic nation was allowed by Constantine to settle in Mœsia. Before the year 420 most of the Gothic nations who had settled within the limits of the Roman empire had been converted to the Christian faith; but, 215 Their primary seat.

(B) Lib. vii. page 295, B.; ibid. page 305. G. (Casaubon). From this passage it appears, that the Greeks were of opinion that the Getæ were Thracians. *Plin. Nat. Hist.* lib. iv. cap. 11. mentions a tribe of the Getæ called *Gaudæ*.

but, unhappily, the greater part of the apoſtles by whom they had been proſelyted, were Arians, which proved fatal to many of the orthodox Chriſtians; for the Arian Goths perſecuted them with unrelenting cruelty.

216 Remains of genuine Gothic.

About the year 367, Ulphilas biſhop of the Mœſian Goths, tranſlated the New Teſtament into the Gothic language. The remains of this tranſlation furniſh a genuine, and at the ſame time venerable, monument of the ancient Gothic dialect. No more is now extant of that valuable tranſlation than the four Goſpels, and another fragment containing part of the epiſtle to the Romans. The Goſpels have been repeatedly publiſhed ſince the firſt edition by Junius 1665, down to that of Mr Lye. Other fragments of the Gothic language have alſo been found, which our curious readers may ſee in Lye's Notes to his Edition of the Gothic Goſpels. The fragment of the Epiſtle to the Romans was lately diſcovered in the library at Wolfenbuttle, and publiſhed by Knitel archdeacon of Wolfenbuttle.

The Goths, prior to the age of Ulphilas, were ignorant of the uſe of alphabetical characters. The biſhop fabricated an alphabet for them, which is a medley of Greek and Roman letters, but rather inclining to the former.

217 Gothic alphabet.

This alphabet conſiſts of 25 letters (ſee Plate XV.). Junius has carefully analyzed thoſe letters, and pointed out their powers and ſounds in his Gothic alphabet, prefixed to his *Gloſſarium Gothicum*. They were long retained in all the European languages derived from the Gothic ſource, which will be enumerated in the ſequel.

What kind of language the ancient Gothic was, is plain from the fragments above mentioned; but in what reſpects it agrees with the oriental tongues, or differs from them, is not eaſy to aſcertain with preciſion. We have obſerved in our ſection on the Greek, that a conſiderable part of that language muſt have been derived from the Thracian; which, according to Strabo there quoted, was the ſame with the Getic or Gothic. The Thracian tongue will, we are convinced upon compariſon, be found analogous to the Chaldean or Syrian. The German, which is a genuine deſcendant of the Gothic, is full of Perſian words: the old Perſian or Pahlavi appears to be a dialect of the Chaldean. The learned Junius, near the beginning of his Gothic alphabet, remarks, that a very conſiderable part of the language in queſtion is borrowed from the moſt ancient Greek.

218 Gothic language derived from the Chaldean, &c.

Both the learned Ihre in his *Gloſſarium Suio-Gothicum*, and Wachter in his excellent German and Latin Dictionary, often remark the coincidence of Gothic and German words with oriental vocables of the like ſound and of the ſame ſignification. In the old Saxon, which is another ramification of the Gothic tongue, numberleſs terms of the very ſame complexion appear. From this deduction we hope it will follow, that the Gothic tongue, in its original unmixed ſtate as it was ſpoken by the ancient Getæ, was a dialect of the primeval language; that language which the ſons of Tiras brought with them from the plains of Shinar or from Armenia, or from any other region where the primitive mortals had fixed their reſidence. To confirm this poſition, we ſhall annex a few inſtances.

The Thracian tribes, in all probability, firſt took poſſeſſion of thoſe tribes of Aſia Minor which ſtretch towards the eaſt. Thence they croſſed the Helleſpont, and ſpread themſelves far and wide northward. Strabo ſuppoſes that they firſt ſettled in the regions to the north of thoſe ſtraits, and thence tranſported numerous colonies into Aſia Minor. The reverſe was probably the caſe: but be that as it may, it is univerſally agreed, that both ſides of the Helleſpont were peopled with Thracians.

In Aſia Minor we meet with the city Perga, which, throwing away the *a*, is *Perg*. In every tongue deſcended from the Gothic, the word *Berg* ſignifies "a rock," and metaphorically a "town or burgh;" becauſe towns were originally built on rocks for the ſake of defence. Hence likewiſe *Pergamos*, the fort or citadel of Troy. *Beira* in Thracian ſignified a "city;" the Chaldaic and Hebrew word *Beer* imports a "well," and is poſſibly the original of the Gothic word *beer*, *ale*. In ancient times, eſpecially in the Eaſt, it was cuſtomary to build cities in the neighbourhood of fountains. The ancients called the Phrygians Βρυγες, *Bryges*, or *Bruges*; the Gothic word coinciding is obvious. *Dyndymus*, the name of a city ſacred to Cybele, is compounded of two Gothic words *dun* and *dum*, both ſignifying "a height, an eminence;" and hence *a town, an incloſure*. The word *tros* ſeems to be the very Gothic *troſh*, "brave, valiant." The words *fader*, *mader*, *dochter*, *bruder*, are ſo obviouſly Perſian, that every etymologiſt has aſſigned them to that language.

Many futile etymologies have been given of the ſacred name *God*, which is in reality the Perſian word *Choda*, commonly applied by them to their *Hormazd* or *Oromazes*. The Perſian *bad* or *bod* ſignifies a "city;" the ſame word in Gothic imports a "houſe, a manſion, an abode." *Band*, in Perſic, a "ſtrait place;" in Gothic, "to bend." *Heim* or *ham*, "a houſe," is generally known to be of Perſian original. Much critical ſkill has been diſplayed in tracing the etymology of the Scotch and old Engliſh word *Yule*, "Chriſtmas." *Yule*, derived from *iul*, was a feſtival in honour of the ſun, which was originally celebrated at the winter ſolſtice. *Wick* or *wich* is a Gothic term ſtill preſerved in many names of towns; it ſignifies "a narrow corner, or ſmall ſtrip of land jutting into the ſea, or into a lake or river:" hence the Latin *vicus*, and Greek οικος. In Spaniſh, we have many old Gothic words; among others *hijo* a "ſon," the ſame with the Greek υιος. In ſome places of Scotland, we call any thing that is little, ſmall, *wee*; originally ſpelt *wi*, if we miſtake not, from the very ſame word.

Theſe few examples we have thrown together, without any regard to order, perſuaded that almoſt every word of the language, truly Gothic, may with a little pains and judgment be traced to ſome oriental root or cognate. We may obſerve in paſſing, that many Gothic nouns end in *a*, like the Chaldaic and Syriac; that their ſubſtantive verb very much reſembles that of the Perſian, Greek, and Latin; and that their active and auxiliary verb has furniſhed the common preterperfect tenſe of Greek verbs in the active voice: that verb is *haban*,

Gothic Language. *haban*, but originally *ha*, as the common people pronounce it at this day, especially in the north of Scotland, and among the Swedes, Danes, Norwegians, and Icelanders.

219 Modern tongues deduced from the Gothic.

We shall now leave the other inferior arrangements of this ancient language to grammarians and lexicographers, and proceed to inquire what modern tongues are deduced from it as their stock, and which of them makes the nearest approaches to its simplicity and rusticity.

We have already observed that the Goths, formerly Getæ, were possessed of a vast extent of country, reaching from the frontiers of Thrace to the banks of the Ister or Danube. We have seen that a colony of them settled in Mœsia under Constantine II. They then spread themselves into Dacia, and from thence into Germany. All these countries were situated in such a manner, that the progress of population was forward, and according to the natural course of emigration. From Germany they extended themselves into Scandinavia, that is, Sweden, Denmark, and Norway. Their whole ancient *Edda*, *Sagas*, "Chronicles," show that the Goths arrived in Scandinavia by this route, without, however, fixing the era of that event with any tolerable degree of accuracy. By the Germans, we believe the ancients understood all the nations eastward, westward, and northward, reaching from the Danube on the south up to the extremity of Scandinavia on the Northern ocean; and from the Rhine and German ocean on the west, to the river Chronus or Niemen on the east. All those nations spoke one or other of the Gothic dialects, some approaching nearer, and others deviating farther from, the parent language.

The Francic is a dialect of the Teutonic, *Tudesque*, or old German; and the Gospels of Ulphilas bear such a resemblance to the Francic, fragments of which are preserved in the early French historians, that some learned men have pronounced those gospels to be part of an old Francic version; but others of equal respectability have refuted this opinion, both from history and comparison of the dialects. Schilter has given us large monuments of the Tudesque or old German from the seventh century, which evidently prove that the Gothic of Ulphilas is the same language. Wachter's learned Glossary of the ancient German likewise confirms this position. Mr Ihre, after hesitating whether the Gospels of Ulphilas bear most resemblance to the German or Scandinavian dialect of the Gothic, declares at last in favour of the former. The Anglo-Saxon is also known to be a venerable dialect of the Tudesque; and is so intimately connected with the gospels, that some valuable works on this subject are wholly built upon that supposition.

The Icelandic is the oldest relick of the Scandinavian. It begins with Arius Frode in the eleventh century, and is a dialect of the German. The remains we have of it are more modern by four centuries than those of the German: they are more polished than the other. The words are shortened, not only because they are more modern than the German, but because the Icelandic was polished by a long succession of poets and historians almost equal to those of Greece and Rome. Hence the Icelandic, being a more polished language than the German, has less affinity with the parent Gothic. The Swedish is more nearly related to the Icelandic than either the Danish or Norwegian. That the Swedish is the daughter of the Gothic, is fully shown by Mr Ihre above mentioned, in his *Glossarium Suio-Gothicum*. There is, therefore, no manner of doubt as to the identity of the Gothic, preserved in Ulphilas and other ancient remains, with the German and Scandinavian tongue.

The modern German, a language spoken in a far greater extent than any other of modern Europe, resembles the Gothic Gospels more than the present Danish, Norwegian, or Swedish; and has certainly more ancient *stamina*. Its likeness to the Asiatic tongues, in harshness and inflexible thickness of sound, is very apparent.

Busbequius shows, that the clowns of Crim Tartary, remains of the ancient Goths, speak a language almost German. These clowns were no doubt descendants of the ancient Goths, who remained in their native country after the others had emigrated. It is therefore apparent from the whole of this investigation, that the Gothic was introduced into Europe from the East, and is probably a dialect of the language originally spoken by men.

§ 3. *Of the Sclavonian Language.*

220 Sclavonic language.

There is another language which pervades a considerable part of Europe, and this, like the Gothic, seems to have originated in the east. The language we mean is the Sclavonic or rather Slavonic, which prevails far and wide in the eastern parts of this division of the globe. It is spoken by the Dalmatians, by the inhabitants of the Danubian provinces, by the Poles, Bohemians, and Russians. The word *slab*, that is, "slave," (whence the French word *esclave*, and our word *slave*), signifies "noble, illustrious;" but because in the lower ages of the Roman empire, vast multitudes of these people were spread over all Europe in the quality of slaves, that word came to denote the servile tribe by way of distinction in the same manner as the words *Geta*, *Davus*, and *Syrus*, did among the Greeks at a more early period.

221 spoken by the Slavi one of the tribes of the Sarmatians.

The Slavi dwelt originally on the banks of the Borysthenes, now the Dnieper or Nieper. They were one of the tribes of the European Sarmatians who in ancient times inhabited an immense tract of country, bounded on the west by the Vistula, now the Weisel; on the south-east by the Euxine sea, the Bosphorus Cimmerius, the Palus Mœotis, and the Tanais or Don, which divides Europe from Asia.

In this vast tract of country, which at present comprehends Poland, Russia, and a great part of Tartary, there dwelt in ancient times many considerable tribes. To enumerate these, we believe, would not much edify our readers: we shall only inform them, that among these Sarmatian clans were the Roxolani, now the Russians, and likewise the Slavi, who dwelt near the Borysthenes, as was observed above.

The Slavi gradually advanced towards the Danube; and in the reign of Justinian having passed that river, they made themselves masters of that part of Illyricum which lies between the Drave and the Save, and is to this day from them called *Sclavonia*. These barbarians by degrees overran Dalmatia, Liburnia, the western parts of Macedonia, Epirus; and on the east they extended their quarters all along to the western

Sclavonian Language.

bank of the Danube, where that river falls into the Euxine. In all theſe countries, the Sclavonian was deeply impregnated with the Greek, which was a thing of courſe, ſince the barbarian invaders ſettled in thoſe regions, and mingled with the aborigines, who ſpoke a corrupt dialect of that language.

222 the Poles,

The Poles are the genuine deſcendants of the ancient Sarmatæ (c), and conſequently ſpeak a dialect of their language, but much adulterated with Latin words, in conſequence of the attachment the Polanders have long profeſſed to the Roman tongue.

223 Sileſians, and

The Sileſians and Bohemians have corrupted their dialects in the very ſame manner. In thoſe countries, then, we are not to ſearch for the genuine remains of the ancient Sarmatian.

224 Ruſſians, deſcended from the Slavi.

The modern Ruſſians, formerly the Rhoxani or Roxolani, are the poſterity of the Sarmatæ, and are a branch of the Slavi: they inhabit a part of the country which that people poſſeſſed before they fell into the Roman provinces; they ſpeak the ſame language, and wear the very ſame dreſs; for, on the hiſtorical pillar at Conſtantinople, the Sclavonians are dreſſed like the Ruſſian boors. If then the Slavi are Sarmatæ, the Ruſſians muſt of courſe be the deſcendants of the ſame people. They were long a ſequeſtered people, and conſequently altogether unconnected with the other nations of Europe. They were ſtrangers to commerce, inhoſpitable to ſtrangers, tenacious of ancient uſages, averſe to improvements of every kind, wonderfully proud of their imaginary importance; and, in a word, a race of people juſt one degree above abſolute ſavagiſm. A people of this character are, for the moſt part, enemies to innovations; and if we may believe the Ruſſian hiſtorians, no nation was ever more averſe to innovations than the one in queſtion. From the ninth century, at which era they embraced Chriſtianity, it does not appear that they moved one ſtep forward towards civilization, till Peter the Great, not a century ago, in conſequence of his deſpotic authority, compelled them to adopt the manners and cuſtoms of their more poliſhed neighbours.

We may then conclude, that the Ruſſians made as little change in their language during that period, as they did in their dreſs, habits, and manner of living. Whatever language they ſpoke in the ninth century, the ſame they employed at the beginning of the 18th. They were, indeed, according to *Appian de bel. Mithrid.* once conquered by Diophantus, one of Mithridates's generals, but that conqueſt was for a moment only: they were likewiſe invaded, and their country overrun, by the great Timor or Tamerlane; but this invaſion was like a torrent from the mountains, which ſpreads devaſtation far and wide while it rages, but makes little alteration on the face of the country.

We find likewiſe, that upon ſome occaſions they made incurſions upon the frontiers of the Roman empire; but we hear of no permanent ſettlements formed by them in theſe quarters. Upon the whole, we take the Ruſſians to have been, with reſpect to their language, in the very ſame predicament with the highlanders and iſlanders of Scotland, who, according to the general opinion, have preſerved the Celtic dialect pure and entire, in conſequence of their having never mingled with foreigners.

225 The Ruſſian language genuine Sclavonic.

From this deduction we may infer two things; firſt, that the Ruſſian language is the genuine Sclavonian; and, ſecondly, that the latter is the ſame, or nearly the ſame, with the ancient Sarmatian.

In the Ruſſian, there are found a great number of words reſembling the old ſimple roots of the Greek both in ſound and ſignification; its grammatical genius is nearly the ſame; and we are informed by the very beſt authority, that there is in this language a tranſlation of Epictetus, in which there are whole pages, in both original and tranſlation, without one ſingle tranſpoſition. Monſ. Leveque, who has publiſhed a tranſlation of a hiſtory of Ruſſia, is ſo entirely convinced of the ſtrict analogy between the ancient Greek and the modern Ruſſe, that he is poſitive that the former is derived from the latter. Monſ. Freret, a very learned French academician, is clearly of the ſame opinion. We are, however, perſuaded that this opinion is ill founded. We rather imagine, that thoſe coincidences ariſe from the relicks of the primitive language of mankind; veſtiges of which, we believe, are to be found almoſt in every tongue now exiſting.

It is, however, we allow, uncommonly difficult to render a reaſon for the ſyntaxical analogy of the two languages, without admitting the truth of the one or the other hypotheſis. We have examined with ſome care a good number of Ruſſian vocables, and compared them with Greek ones of the ſame ſignification. We have not, however, found ſuch a reſemblance as we think neceſſary to ſupport the poſition advanced above.

226 Reſemblance between Ruſſian and oriental words.

We have indeed found a very ſtrong reſemblance between the former and many oriental words, eſpecially Hebrew, Chaldean, and old Perſian, of which we could produce ſeveral inſtances, did the nature of our preſent inquiry admit ſuch a deviation. Every body knows that the Sarmatæ were divided into two great nations, the Aſiatic and European; the former extended very far eaſtward, behind the mountain Caucaſus, the northern ſhore of the Euxine ſea, and ſo forth. Theſe, we may believe, derived their language from the original tongue long before the Greek language exiſted. This, in compariſon of the Hebrew, Phœnician, Egyptian, Arabian, Chaldean, &c. was but of yeſterday. The Greek, moſt learned men are now convinced, was a late compoſition of many different dialects, incorporated with the jargon of the aboriginal Ionim or Greeks. The Sarmatian, on the contrary, was the tongue of a great and populous nation, civilized, in all appearance, long before the Greeks began to emerge from a ſtate of ſavagiſm. We are, therefore, by no means diſpoſed to allow, either that the Greek is derived from the Ruſſian, or the Ruſſian from the Greek. We believe there is juſt the ſame reaſon for this concluſion, that the Abbé Pezron and Monſ. Gebelin pretend to have diſcovered, in order to ſupport their poſition that the Greek is derived from the Celtic. Certain it is, that the reſemblance among the oriental

(c) This appears by their character, their laws, their manners, their form of government, their military equipage, their impetuoſity, their ariſtocratic ſplendour.

oriental languages, of which we take the Sarmatian to have been one, is ſo palpable, that any perſon of a moderate capacity who is perfectly maſter of one, will find little difficulty in acquiring any other. If, therefore, the coincidence between the Greek and Ruſſian ſhould actually exiſt, we think this circumſtance will not authenticate the ſuppoſition, that either of the two is derived from the other.

In the courſe of this argument, our readers will be pleaſed to obſerve, that we all along ſuppoſe, that the Sclavonian, of which we think the Ruſſian is the moſt genuine remain, is the ſame with the old Sarmatian. We ſhall now take the liberty to hazard a conjecture with reſpect to the ſyntaxical coincidence of that language with the Greek; for we acknowledge that we are not ſo profoundly verſed in the Ruſſian dialect of the Sclavonian as to pretend to pronounce a definitive ſentence.

As the Ruſſians were a generation of ſavages, there is no probability that they were acquainted with the uſe

227. Origin of the ſyntaxical coincidence between this language and the Greek.

of letters and alphabetical writing till they acquired that art by intercourſe with their neighbours. It is certain, beyond all contridiction, that few nations had made leſs proficiency in the fine arts than that under conſideration: and we think there is little appearance of their having learned this art prior to their converſion to Chriſtianity. Certain it is, that the Slavi, who ſettled in Dalmatia, Illyria, and Liburnia, had no alphabetical characters till they were furniſhed with them by St Jerome. The Servian character, which very nearly reſembles the Greek, was invented by St Cyril; on which account the language written in that character is denominated *Chiurilizza*. Theſe Sclavonic tribes knew nothing of alphabetic writing prior to the era of their converſion. The Mœſian Goths were in the ſame condition till their biſhop Ulphilas fabricated them a ſet of letters.

If the Slavi and Goths, who reſided in the neighbourhood of the Greeks and Romans, had not learned alphabetical writing prior to the era of their converſion to Chriſtianity, it muſt hold, *à fortiori*, that the Ruſſians, who lived at a very great diſtance from thoſe nations, knew nothing of this uſeful art antecedent to the period of their embracing the Chriſtian faith.

The Ruſſians pretend that they were converted by St Andrew; but this is known to be a fable. Chriſtianity was firſt introduced among them in the reign of the grand duke Wolodimar, who marrying the daughter of the Grecian emperor Baſilius, became her convert about the year 989. About this period, we imagine, they were taught the knowledge of letters by the Grecian miſſionaries, who were employed in teaching them the elements of the Chriſtian doctrines. Their alphabet conſiſts of 31 letters, with a few obſolete additional ones; and theſe characters reſemble thoſe of the Greeks ſo exactly, that there can be no doubt of their being copied from them. It is true, the ſhape of ſome has been ſomewhat altered, and a few barbarian ones have been intermingled. The Ruſſian liturgy, every body knows, was copied from that of the Greeks; and the beſt ſpecimen of the old Ruſſian is the church offices for Eaſter, in the very words of Chryſoſtom, who is called by his name *Zlato uſtii*, "golden-mouthed" The power of the clergy in Ruſſia was exceſſive; and no doubt their influence was proportioned to their power. The firſt race of clergy in that country were undoubtedly Greeks. We know how active and induſtrious thoſe people were in propagating their language as well as their religion. The offices of religion might be at firſt written and pronounced in the Greek tongue, but it would ſoon be found expedient to have them tranſlated into Ruſſian. The perſons employed in this work muſt have been Greeks, who underſtood both languages.

As it is confeſſedly impoſſible that a people ſo dull and unattentive as the Ruſſians originally were, could ever have fabricated a language ſo artificially conſtructed as their preſent dialect; and as it is obvious, that, till Chriſtianity was introduced among them by the Greeks, they could have no correſpondence with that people—it muſt appear ſurpriſing by what means their language came to be faſhioned ſo exactly according to the Greek model. We have obſerved above, that the Ruſſian letters muſt have been invented and introduced into that country by the Greek miſſionaries. We think it probable, that thoſe apoſtles, at the ſame time that they taught them a new religion, likewiſe introduced a change into the idiom of their language. The influence of thoſe ghoſtly teachers over a nation of ſavages muſt have been almoſt boundleſs; the force of their precepts and example almoſt incontrollable. If the ſavage converts accepted a new religion from the hands of thoſe Grecian apoſtles, they might with equal ſubmiſſion adopt improvements in their language. Such of the natives as were admitted to the ſacerdotal function muſt have learned the Greek language, in order to qualify them for performing the offices of their religion. A predilection for that language would be the immediate conſequence. Hence the natives, who had been admitted into holy orders, would co-operate with their Grecian maſters in improving the dialect of the country; which, prior to the period above mentioned, muſt have greatly deviated from the original ſtandard of the Sarmatian tongue.

Upon this occaſion, we imagine the Greek apoſtles, in conjunction with their Ruſſian diſciples, reduced the language of the country to a reſemblance with the Greek idiom. They retained the radical vocables as they found them; but by a variety of flections, conjugations, derivations, compoſitions, and other modifications, transformed them into the Grecian air and apparel. They muſt have begun with the offices of the church; and among a nation of ſavages newly converted, the language of the new religion would quickly obtain a very extenſive circulation. When the Grecian garniture was introduced into the church, the laity would in proceſs of time aſſume a ſimilar dreſs. The fabric of the Grecian declenſions, conjugations, &c. might be grafted upon Ruſſian ſtocks without affecting the radical parts of the language. If the dialect in queſtion, like moſt others of a very ancient date, laboured under a penury of vocables, this manœuvre would contribute exceedingly to ſupply that defect. By this expedient the Greek language itſelf had been enlarged from about 300 radical terms to the prodigious number of words of which it now conſiſts.

The Latin tongue we have ſeen above in its original conſtitution differed widely from the Greek; and notwithſtanding this incongruity, the improvers of the former have preſſed it into a very ſtrict agreement with the latter.

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latter. This, we think, was ſtill a more difficult taſk; as, in our opinion, the genius of the Latin differs in a much greater degree than that of the Ruſſian does from the Greek. We know, that the genius of the Gothic tongue and thoſe of all its deſcendants are much more in uniſon with the Greek than with that of the Latin. The Spaniſh, Italian, and French, have cudgelled many of their Gothic, Teutonic, and Celtic verbs, into a kind of conjugations, imitating or rather aping thoſe of the Latin. The Perſians have formed moſt elegant and energetic declenſions and conjugations, upon inflexible roots, borrowed from the Pahlavi and Deri, and even from Tartar originals.

Upon the grounds above mentioned we have taken the liberty to hazard the following conjectures, which we cheerfully ſubmit to the cognizance of our more enlightened readers.

1. That the Sarmatian was a dialect of the original language of mankind.

2. That the Sclavonian was a dialect of the Sarmatian.

3. That the Ruſſe is the moſt genuine unſophiſticated relick of the Sclavonian and Sarmatian.

4. That the Ruſſians had no alphabetic characters prior to the era of the introduction of Chriſtianity, that is, towards the end of the tenth century.

5. That they were converted by Grecian miſſionaries.

6. That thoſe miſſionaries copied their preſent letters from thoſe of Greece; and in conjunction with the more enlightened natives, reduced the original unimproved Ruſſe to its preſent reſemblance to the Greek ſtandard.

228 Ruſſian nouns.

The Ruſſian language, like moſt others, contains eight parts of ſpeech, noun, pronoun, &c. Its nouns have three genders, maſculine, feminine, and neuter; it has alſo a common gender for nouns, intimating both ſexes. It has only two numbers, ſingular and plural. Its caſes are ſeven, nominative, genitive, dative, accuſative, vocative, inſtrumental, and prepoſitive. Theſe caſes are not formed by varying the termination, as in Greek and Latin; but generally by placing a vowel after the word, as, we imagine, was the original practice of the Greeks (See *Greek* Section). Thus in Ruſſe, ρυκ, *ruk*, "the hand;" nominative, ρυκ-α, "the hand;" genitive, ρυκ-Ν` "of the hand," &c. See *Les Elem. de la Langue Ruſſe par Charpentier.* Nouns ſubſtantive are

229 Adjectives

reduced to four declenſions, and adjectives make a fifth. Theſe agree with their ſubſtantives in caſe, gender, and number. They have three degrees of compariſon, as is common in other languages; the poſitive, comparative, and ſuperlative. The comparative is formed from the feminine of the nominative ſingular of the poſitive, by changing *a* into *te*, that is, *ate* in Engliſh; the ſuperlative is made by prefixing προ, *pre*, before the poſitive. Theſe rules are general; for the exceptions, recourſe muſt be had to the Ruſſian grammar above mentioned.

The numeral adjectives in Ruſſe have three genders like the reſt, and are declined accordingly. Their pronouns have nothing peculiar, and are divided and arranged in the ſame manner as in other languages. Verbs

230 Verbs.

in the Ruſſian language are comprehended under two conjugations. The moods are only three; the indicative, the imperative, and the infinitive: the ſubjunctive is formed by placing a particle before the indicative. Its tenſes are eight in number; the preſent, the imperfect, the preterite ſimple, the preterite compound, the plupfect, the future indeterminate, the future ſimple, the future compound. The verbs have their numbers and perſons as in other languages. To enter into a detail of their manner of conjugating their verbs would neither be conſiſtent with our plan, nor, we are perſuaded, of much conſequence to our readers. Their other parts of ſpeech differ nothing from thoſe of other languages. Their ſyntax nearly reſembles that of the Greek and Latin. All theſe articles muſt be learned from a grammar of the language. Whether there is any grammar of the Ruſſian language compoſed in Engliſh we know not. That of Monſ. Charpentier in French, printed at Peterſburgh in 1768, is the only one we have ſeen, and which appears to us a very excellent one. We could wiſh to be able to gratify our readers with a more authentic account of the origin of the Sclavonian language; but this we find impoſſible, in conſequence of the want of memorials relating to the ſtate of the ancient Sarmatæ. Towards the era of the ſubverſion of the weſtern empire, the nations who inhabited the countries in queſtion were ſo blended and confounded with each other, and with Huns and other Scythian or Tartar emigrants, that we believe the moſt acute antiquarian would find it impoſſible to inveſtigate their reſpective tongues, or even their original reſidence or extraction. We have ſelected the Ruſſe as the moſt genuine branch of the old Sclavonian, and to this predilection we were determined by the reaſons above mentioned. We are ſorry that we are not ſo well acquainted with the idiom of the Ruſſian language as to be able to compare it with thoſe of the eaſt; but upon ſuch a compariſon, we are perſuaded that the radical materials of which it is compoſed would be found to have originated in the oriental regions. The word *Tſar*, for example, is probably the Phœnician and Chaldean *Sar*, or *Zar*, "a prince, a grandee." Diodorus Siculus calls the queen of the Maſſagetæ, who, according to Cteſias, cut off Cyrus's head, *Zaring*; which was not many years ago the general title of the empreſs of all the Ruſſias. Herodotus calls the ſame princeſs *Tomyris*, which is the very name of the famous Timor or Tamur, the conqueror of Aſia. The former ſeems to have been the title, and the latter the proper name, of the queen of the Maſſagetæ. In the old Perſian or Pahlavi, the word *Gard* ſignifies "a city;" in Ruſſian, *Gorad* or *Grad* intimates the very ſame idea: hence *Conſtantinople* in old Ruſſe is called *Tſargrad* or *Tſargorad*. Theſe are adduced as a ſpecimen only; and able etymologiſts might, we believe, diſcover a great number.

231 Phœnician and Chaldean words in Ruſſe.

The Sclavonian language is ſpoken in Epirus, the weſtern part of Macedonia, in Boſnia, Servia, Bulgaria, in part of Thrace, in Dalmatia, Croatia, in Poland, Bohemia, Ruſſia, and Mingrelia, in Aſia, whence it is frequently uſed in the ſeraglio at Conſtantinople. Many of the great men of Turkey underſtand it, and frequently uſe it; and moſt of the janizaries having been ſtationed in garriſons on the Turkiſh frontiers in Europe, uſe it as their vulgar tongue. The Hungarians, however, and the natives of Wallachia, ſpeak a different language: and this language bears evident ſignatures of the Tartarian dialect, which was the tongue of the original Huns. Upon the whole, the Sclavonian is by much the moſt extenſive language in Europe, and extends far into Aſia.

SECT.

Modern Languages.

SECT. X. *Modern Languages.*

If we call all the different dialects of the various nations that now inhabit the known earth, languages, the number is truly great; and vain would be his ambition who ſhould attempt to learn them, though but imperfectly. We will begin with naming the principal of them: There are four, which may be called original or mother-languages, and which ſeem to have given birth to all that are now ſpoken in Europe. Theſe are the *Latin, Celtic, Gothic,* and *Sclavonian*. It will not, however, be imagined, from the term *original* given to theſe languages, that we believe them to have come down to us, without any alteration, from the confuſion of tongues at the building of the tower of Babel. We have repeatedly declared our opinion, that there is but one truly original language, from which all others are derivatives variouſly modified. The four languages juſt mentioned are original only as being the immediate parents of thoſe which are now ſpoken in Europe.

232 Parent dialects of Europe, with their reſpective offſpring.

I. From the *Latin* came,

1. The Portugueſe.
2. Spaniſh.
3. French.
4. Italian.

From the *Celtic*,

5. The Erſe, or Gaelic of the Highlands of Scotland.
6. The Welſh.
7. The Iriſh.
8. Baſſe-Bretagne.

From the *Gothic*,

9. The German.
10. The Low Saxon or Low German.
11. The Dutch.
12. The Engliſh; in which almoſt all the noun-ſubſtantives are German, and many of the verbs French, Latin, &c. and which is enriched with the ſpoils of all other languages.
13. The Daniſh.
14. The Norwegian.
15. Swediſh.
16. Icelandic.

From the *Sclavonian*,

17. The Poloneſe.
18. The Lithuanian.
19. Bohemian.
20. Tranſylvanian.
21. Moravian.
22. The modern Vandalian, as it is ſtill ſpoken in Luſatia, Pruſſian Vandalia, &c.
23. The Croatian.
24. The Ruſſian or Muſcovite; which, as we have ſeen, is the pureſt dialect of this language.
25. The language of the Calmucs and Coſſacs.
26. Thirty-two different dialects of nations who inhabit the north-eaſtern parts of Europe and Aſia, and who are deſcended from the Tartars and Huno-Scythians. There are polyglott tables which contain not only the alphabets, but alſo the principal diſtinct characters of all theſe languages.

Modern Languages.

II. The languages at preſent generally ſpoken in Aſia are,

233 Aſiatic languages.

27. The Turkiſh and Tartarian, with their different dialects.
28. The Perſian.
29. The Georgian or Iberian.
30. The Albanian or Circaſſian.
31. The Armenian.

(28–31: Theſe languages are ſpoken by the Greek Chriſtians in Aſia under the patriarch of Conſtantinople.)

32. The modern Indian.
33. The Formoſan.
34. The Indoſtanic.
35. The Malabarian.
36. The Warugian.
37. The Talmulic or Damulic.

(33–37: The Daniſh miſſionaries who go to Tranquebar, print books at Hall in theſe languages.)

38. The modern Arabic.
39. The Tanguſian.
40. The Mungalic.
41. The language of the Nigarian or Akar Nigarian.
42. The Gruſinic or Gruſinian.
43. The Chineſe.
44. The Japaneſe.

We have enumerated here thoſe Aſiatic languages only of which we have ſome knowledge in Europe, and even alphabets, grammars, or other books that can give us information concerning them. There are doubtleſs other tongues and dialects in thoſe vaſt regions and adjacent iſlands; but of theſe we are not able to give any account.

III. The principal languages of Africa are, 234 African languages.

45. The modern Egyptian.
46. The Fetuitic, or the language of the kingdom of Fetu.
47. The Moroccan; and,
48. The jargons of thoſe ſavage nations who inhabit the deſert and burning regions. The people on the coaſt of Barbary ſpeak a corrupt dialect of the Arabic. To theſe may be added the Chilhic language, otherwiſe called *Tamazeght*; the Negritian, and that of Guinea; the Abyſſinian; and the language of the Hottentots.

IV. The languages of the American nations are but little known in Europe. Every one of theſe, though diſtant but a few days journey from each other, have their particular language or rather jargon. The languages of the Mexicans and Peruvians ſeem to be the moſt regular and poliſhed. There is alſo one called *Poconchi* or *Pocomana*, that is uſed in the bay of Honduras and towards Guatimal, the words and rules of which are moſt known to us. The languages of North America are in general the Algonkic, Apalachian, Mohogic, Savanahamic, Virginic, and Mexican: and in South America, the Peruvian, Caribic, the language of Chili, the Cairic, the Tucumanian, and the languages uſed in Paraguay, Braſil, and Guiana. 235 American languages.

V. We have already ſaid, that it would be a vain and ſenſeleſs undertaking for a man of letters to attempt the ſtudy of all theſe languages, and to make his head an univerſal dictionary; but it would be ſtill more abſurd in us to attempt the analyſis of them in this place: ſome general reflections therefore muſt here ſuffice. Among the modern languages of Europe, the French ſeems to merit great attention; as it is elegant and pleaſing in itſelf; as it is become ſo general, that with it we may travel from one end of Europe to the other 236 General reflections on modern languages.

without

Modern Languages.

without fcarce having any occafion for an interpreter; and as in it are to be found excellent works of every kind, both in verfe and profe, ufeful and agreeable. There are, befides, grammars and dictionaries of this language which give us every information concerning it, and very able mafters who teach it; efpecially fuch as come from thofe parts of France where it is fpoken correctly; for with all its advantages, the French language has this inconvenience, that it is pronounced fcarce anywhere purely but at Paris and on the banks of the Loire. The language of the court, of the great world, and of men of letters, is moreover very different from that of the common people; and the French tongue, in general, is fubject to great alteration and novelty. What pity it is, that the ftyle of the great Corneille, and that of Moliere, fhould already begin to be obfolete, and that it will be but a little time before the inimitable *chefs d'œuvres* of thofe men of fublime genius will be no longer feen on the ftage: The moft modern ftyle of the French, moreover, does not feem to be the beft. We are inclined to think, that too much concifenefs, the epigrammatic point, the antithefis, the paradox, the fententious expreffions, &c. diminifh its force; and that, by becoming more polifhed and refined, it lofes much of its energy.

VI. The German and Italian languages merit likewife a particular application; as does the Englifh, perhaps above all, for its many and great excellencies (See LANGUAGE). Authors of great ability daily labour in improving them; and what language would not become excellent, were men of exalted talents to make conftant ufe of it in their works! If we had in Iroquois books like thofe which we have in Englifh, Italian, French, and German, fhould we not be tempted to learn that language? How glad fhould we be to underftand the Spanifh tongue, though it were only to read the Araucana of Don Alonzo D'Ercilia, Don Quixote, fome dramatic pieces, and a fmall number of other Spanifh works, in the original; or the poem of Camoens in Portuguefe.

VII. The other languages of Europe have each their beauties and excellencies. But the greateft difficulty in all living languages conftantly confifts in the pronunciation, which it is fcarce poffible for any one to attain unlefs he be born or educated in the country where it is fpoken: and this is the only article for which a mafter is neceffary, as it cannot be learned but by teaching or by converfation: all the reft may be acquired by a good grammar and other books. In all languages whatever, the poetic ftyle is more difficult than the profaic: in every language we fhould endeavour to enrich our memories with great ftore of words (*copia verborum*), and to have them ready to produce on all occafions: in all languages it is difficult to extend our knowledge fo far as to be able to form a critical judgment of them. All living languages are pronounced rapidly, and without dwelling on the long fyllables (which the grammarians call *moram*): almoft all of them have articles which diftinguifh the genders.

VIII. Thofe languages that are derived from the Latin have this further advantage, that they adopt without reftraint, and without offending the ear, Latin and Greek words and expreffions, and which by the aid of a new termination appear to be natives of the language. This privilege is forbidden the Germans, who in their beft tranflations dare not ufe any foreign word, unlefs it be fome technical terms in cafe of great neceffity.

PHI PHI

Philomathes, Philomela.

PHILOMATHES, a lover of learning or fcience.

PHILOMELA, in fabulous hiftory, was a daughter of Pandion king of Athens, and fifter to Procne, who had married Tereus king of Thrace. Procne feparated from Philomela, to whom fhe was much attached, fpent her time in great melancholy till fhe prevailed upon her hufband to go to Athens and bring her fifter to Thrace. Tereus obeyed; but he had no fooner obtained Pandion's permiffion to conduct Philomela to Thrace, than he fell in love with her, and refolved to gratify his paffion. He difmiffed the guards whom the fufpicions of Pandion had appointed to watch him; offered violence to Philomela; and afterwards cut out her tongue, that fhe might not difcover his barbarity, and the indignities fhe had fuffered He confined her in a lonely caftle; and having taken every precaution to prevent a difcovery, he returned to Thrace, and told Procne that Philomela had died by the way, and that he had paid the laft offices to her remains. At this fad intelligence Procne put on mourning for the lofs of Philomela; but a year had fcarcely elapfed before fhe was fecretly informed that her fifter was not dead. Philomela, in her captivity, defcribed on a piece of tapeftry her misfortunes and the brutality of Tereus, and privately conveyed it to Procne. She was going to celebrate the orgies of Bacchus when fhe received it, but fhe difguifed her refentment; and as during thofe feftivals fhe was permitted to rove about the country, fhe haftened to deliver her fifter Philomela from her confinement, and concerted with her on the beft meafures of punifhing the cruelty of Tereus. She murdered her fon Itylus, then in the fixth year of his age, and ferved him up as food before her hufband during the feftival. Tereus, in the midft of his repaft, called for Itylus; but Procne immediately informed him that he was then feafting on his flefh, when Philomela, by throwing on the table the head of Itylus, convinced the monarch of the cruelty of the fcene. He drew his fword to punifh Procne and Philomela; but as he was going to ftab them to the heart, he was changed into a hoopoe, Philomela into a nightingale, Procne into a fwallow, and Itylus into a pheafant. This tragedy happened at Daulis in Phocis; but Paufanias and Strabo, who mention the whole of the ftory, are filent about the transformation; and the former obferves, that Tereus, after this bloody repaft, fled to Megara, where he laid violent hands on himfelf. The inhabitants of the place raifed a monument to his memory, where they offered yearly facrifices, and placed fmall pebbles inftead of barley. It was on this monument that the birds called hoopoes were firft feen; hence the

Philomela ‖ Philopœmen.

the fable of his metamorphosis. Procne and Philomela died through excessive grief and melancholy; and as the nightingale's and the swallow's voice is peculiarly plaintive and mournful, the poets have embellished the fable by supposing that the two unfortunate sisters were changed into birds.

PHILONIUM, in *Pharmacy*, a kind of anodyne opiate, taking its name from Philo the inventor.

Ancient Universal History, vol. vi.

PHILOPOEMEN, a celebrated general of the Achæan league, was born in Megalopolis, a city of Arcadia, in Peloponnesus; and from his very infancy discovered a strong inclination to the profession of arms. He was nobly educated by Cassander of Mantinea; a man of great probity, and uncommon abilities. He was no sooner able to bear arms than he entered among the troops which the city of Megalopolis sent to make incursions into Laconia, and in these inroads never failed to give some remarkable instance of his prudence and valour. When there were no troops in the field, he used to employ his leisure time in hunting and such other manly exercises. When Cleomenes king of Sparta attacked Megalopolis, Philopœmen displayed much courage and greatness of soul. He signalized himself no less some time after, in the battle of Sellasia, where Antigonus gained a complete victory over Cleomenes. Antigonus, who had been an eye-witness of his prudent and intrepid behaviour, made very advantageous offers to gain him over to his interest; but he rejected them, having an utter aversion to a court life, which he compared to that of a slave, saying, that a courtier was but a slave of a better condition. As he could not live idle and inactive, he went to the isle of Crete, which was then engaged in war, and served there as a volunteer till he acquired a complete knowledge of the military art; for the inhabitants of that island were in those days accounted excellent warriors, being scarce ever at peace among themselves. Philopœmen, having served some years among the troops of that island, returned home, and was upon his arrival appointed general of the horse; in which command he behaved so well, that the Achæan horse, heretofore of no reputation, became in a short time famous all over Greece. He was soon after appointed general of all the Achæan forces, when he applied himself to the re-establishing of military discipline among the troops of the republic, which he found in a very low condition, and universally despised by their neighbours. Aratus, indeed, was the first that raised the Achæan state to that pitch of power and glory to which it arrived; but the success of his enterprises was not so much owing to his courage and intrepidity as to his prudence and politics. As he depended on the friendship of foreign princes, and their powerful succours, he neglected the military discipline at home; but the instant Philopœmen was created prætor, or commander in chief, he roused the courage of his countrymen, in order to put them into a condition to defend themselves without the assistance of foreign allies. With this view he made great improvements in the Achæan discipline; changing the manner of their exercise and their arms, which were both very defective. He had thus, for the space of eight months, exercised his troops every day, making them perform all the motions and evolutions, and accustoming them to manage with dexterity their arms, when news was brought him that Machanidas was advancing, at the head of a numerous army, to invade Achaia. He was glad of this opportunity to try how the troops had profited by his discipline; and accordingly, taking the field, met the enemy in the territories of Mantinea, where a battle was fought. Philopœmen, having killed Machanidas with his own hand, struck off his head, and carried it from rank to rank, to encourage his victorious Achæans, who continued the pursuit, with great slaughter, and incredible ardour, to the city of Tegea, which they entered together with the fugitives. The Lacedæmonians lost on this occasion above 8000 men, of which 4000 were killed on the spot, and as many taken prisoners. The loss of the Achæans was very inconsiderable, and those that fell were mostly mercenaries. This happened about the year before Christ 204.

Philopœmen.

But what most of all raised the fame and reputation of Philopœmen was his joining the powerful city of Lacedæmon to the Achæan commonwealth; by which means the Achæans came to eclipse all the other states of Greece. This memorable event happened in the year 191. In this transaction we cannot help taking notice of one circumstance, which, in our opinion, reflects greater lustre on Philopœmen than all his warlike exploits. The Lacedæmonians, overjoyed to see themselves delivered from the oppressions they had long groaned under, ordered the palace and furniture of Nabis to be sold; and the sum accruing from thence, to the amount of 120 talents, to be presented to Philopœmen, as a token of their gratitude. Deputies therefore were to be appointed, who should carry the money, and desire Philopœmen, in the name of the senate, to accept of the present. On this occasion it was that the virtue of the generous Achæan appeared in its greatest lustre; for so great was the opinion which the Spartans had of his probity and disinterestedness, that no one could be found who would take upon him to offer the present: struck with veneration, and fear of displeasing him, they all begged to be excused. At last they obliged, by a public decree, one Timolaus, who had formerly been his guest, to go to Megalopolis, where Philopœmen lived, and offer him this testimony of their regard. Timolaus, with great reluctance, set out for Megalopolis, where he was kindly received and entertained by Philopœmen. Here he had an opportunity of observing the strictness of his whole conduct, the greatness of his mind, the frugality of his life, and the regularity of his manners; which struck him with such awe, that he did not dare once to mention the present he was come to offer; insomuch that, giving some other pretence to his journey, he returned home with the money. The Lacedæmonians sent him again; but he could no more prevail upon himself now than the first time to mention the true cause of his journey. At last, going a third time he ventured, with the utmost reluctance, to acquaint Philopœmen with the offer he had to make in the name of the Lacedæmonians. Philopœmen heard him with great calmness; but the instant he had done speaking, he set out with him for Sparta, where, after having acknowledged his obligation to the Spartans, he advised them to lay out their money in reforming or purchasing those miscreants who divided the citizens, and set them at variance by means of their seditious discourses; to the end that, being paid for their silence, they might not occasion so many distractions in the government: "for it is much more advisable (said he) to stop an enemy's mouth than a friend's; as for me, I shall always be your friend, and you

you ſhall reap the benefit of my friendſhip without expence." Such was the diſintereſtedneſs of this noble Achæan!

About two years after this, the city of Meſſene withdrew itſelf from the Achæan league. Philopœmen attacked them; but was wounded, taken priſoner, and poiſoned by the magiſtrates. Thus died one of the greateſt heroes that Greece or any other country ever produced. He was no way inferior in valour, military knowledge, and virtue, to any of the boaſted heroes of Rome. Had Achaia been nearer to an equality with Rome, he would have preſerved his country from the yoke which the Roman republic forced it to bear. Both the Greek and Roman writers put him upon the level with Hannibal and Scipio, who were his contemporaries, and happened to die the ſame year. They allow him to have been not only one of the greateſt commanders, but alſo one of the greateſt ſtateſman of his age. To his valour and prudence Achaia owed her glory, which upon his death began to decline, there being none after him in that republic able to oppoſe her enemies with the like ſteadineſs and prudence: whence Philopœmen was called the laſt of the Greeks, as Brutus was afterwards ſtyled the laſt of the Romans.

PHILOSOPHER, a perſon verſed in philoſophy; or one who makes profeſſion of, or applies himſelf to, the ſtudy of nature.

PHILOSOPHER's Stone, the greateſt object of alchemy, is a long ſought for preparation, which, when found, is to convert all the true mercurial part of metal into pure gold, better than any that is dug out of mines or perfected by the refiner's art,

Some Greek writers in the fourth and fifth centuries ſpeak of this art as being then known; and towards the end of the 13th century, when the learning of the Eaſt had been brought hither by the Arabians, the ſame pretenſions began to ſpread through Europe. It is ſuppoſed that this art, called *alchemy*, was of Egyptian origin; and that when the ancient Greek philoſophers travelled into Egypt, they brought back ſome of the allegoric language of this Egyptian art, ill underſtood, which afterwards paſſed into their mythology. Alchemy was the earlieſt branch of chemiſtry, conſidered as a philoſophical ſcience: in the other parts of chemical knowledge, facts preceded reaſoning or ſpeculation; but alchemy was originally ſpeculative.

The alchemiſts ſuppoſed the general principles of metals to be chiefly two ſubſtances, which they called mercury and ſulphur; they apprehended alſo, that the pure mercurial, ſulphureous, or other principles of which they imagined gold to be compoſed, were contained ſeparately in other bodies: and theſe principles, therefore, they endeavoured to collect, and to concoct and incorporate by long digeſtions; and by thus conjoining the principles of gold, if they could be ſo produced and conjoined, it might be expected that gold would be produced. But the alchemiſts pretend to a product of a higher order, *called the elixir, the medicine for metals, the tincture, the philoſopher's ſtone*; which by being projected on a large quantity of any of the inferior metals in fuſion, ſhould change them into fine gold; which being laid on a plate of ſilver, copper, or iron, and moderately heated, ſhould ſink into the metal, and change into gold all the parts to which it was applied; which, on being properly heated with pure gold, ſhould change the gold into a ſubſtance of the ſame nature and virtue with itſelf, ſo as thus to be ſuſceptible of perpetual multiplication; and which, by continued coction, ſhould have its power more and more exalted, ſo as to be able to tranſmute greater and greater quantities of the inferior metals, according to its different degrees of perfection.

Alchemiſts have attempted to arrive at the making of gold by three methods: the firſt by ſeparation; for every metal yet known, it is affirmed, contains ſome quantity of gold; only, in moſt, the quantity is ſo little as not to defray the expence of getting it out.

The ſecond is by maturation; for the alchemiſts think mercury is the baſis and matter of all metals; that quickſilver purged from all heterogeneous bodies would be much heavier, denſer, and ſimpler, than the native quickſilver; and that by ſubtilizing, purifying, and digeſting it with much labour, and long operations, it is poſſible to convert it into pure gold.

This method is only for mercury. With reſpect to the other metals, it is ineffectual, 1. Becauſe their matter is not pure mercury, but has other heterogeneous bodies adhering to it; and, 2. Becauſe the digeſtion, whereby mercury is turned into gold, would not ſucceed in other metals, becauſe they had not been long enough in the mines.

Weight is the inimitable character of gold, &c. Now mercury, they ſay, has always ſome impurities in it, and theſe are lighter than mercury. Could they be purged away, which they think is not impoſſible, mercury would be as heavy as gold, and what is as heavy as gold is gold, or at leaſt might very eaſily be made gold.

The third method is by tranſmutation, or by turning all metals readily into pure gold, by melting them in the fire, and caſting a little quantity of a certain preparation into the fuſed matter; upon which the fæces retire, are volatilized and burnt, and carried off, and the reſt of the maſs is turned into pure gold. That which works this change in the metals is called the *philoſopher's ſtone*.

Whether this third method be poſſible or not, it is difficult to ſay. We have ſo many teſtimonies of it from perſons who on all other occaſions ſpeak truth, that it is hard to ſay they are guilty of direct falſehood, even when they ſay that they have been maſters of the ſecret. We are told, that it is only doing that by art which nature does in many years and ages. For as lead and gold differ but little in weight, therefore there is not much in lead beſide mercury and gold. Now, if we had any body which would ſo agitate all the parts of lead as to burn all that is not mercury therein, and had alſo ſome ſulphur to fix the mercury, would not the maſs remaining be converted into gold? There is nothing in nature ſo heavy as lead except gold, mercury, and platina, which was not known to theſe reaſoners; it is evident, therefore, there is ſomething in lead that comes very near to gold. But in lead there is likewiſe ſome heterogeneous matter different both from mercury and gold. If therefore 19 ounces of lead be diſſolved by the fire, and 8 ounces be deſtroyed by theſe means, it is argued that we ſhall have the reſt good gold; the ratio of lead to gold being as 11 to 19. If then the philoſopher's ſtone can purify the mercurial matter in lead, ſo as that nothing ſhall remain but the pure mercurial body, and you can

Philosopher's Stone.

fix and coagulate this by means of fulphur, out of 19 ounces of lead you will have 11 of gold: or, if you reduce the lead from 18 to 14, you will then have converted it into mercury; and if you farther purify this mercury to the proper ftandard, you will have gold; provided you have but a fulphur with which to fix and coagulate it. Such is the foundation of the opinion of the philofopher's ftone; which the alchemifts contend to be a moft fubtile, fixed, concentrated fire, which, as foon as it melts with any metal, does, by a magnetic virtue, immediately unite itfelf to the mercurial body of the metal, volatilize and cleanfe off all that is impure therein, and leave nothing but a mafs of pure gold. Many frauds and artifices have unqueftionably been practifed in this operation, and there might be political reafons why princes and others fhould encourage thofe who pretended to a power of furnifhing this inexhauftible fource of wealth; but it would be wrong to cenfure as impoftors all thofe who have declared themfelves convinced, from their own experiments, of the tranfmutability of bafe metals into gold. There are ftrong reafons, however, to believe that the authors have been deceived themfelves by fallacious appearances. Mr Boyle gives an account of a procefs by which he imagines part of the fubftance of gold to have been tranfmuted into filver. He alfo relates a very extraordinary experiment, under the title of the degradation of gold by an anti-elixir, which was publifhed in his own life-time, and fince reprinted in 1739. Hence many have been led to conclude in favour of the alchemical doctrine of the tranfmutability of metals. See an account of this experiment, with remarks upon it by Dr Lewis, in his *Commerce of Arts*, fect. 12. p. 297, &c.

Characters of the Kings and Queens of England.

"The opinion (fays Holt) that one metallic or other foreign fubftance might be changed into another, was, it feems, at this time (reign of Henry VI. of England) propagated by certain chemifts, whofe obfervations on the furprifing effects and alterations produced in certain fubftances by the force of heat carried their imaginations beyond what found judgment might warrant. The firft inftance of which on record is in vol. xi. p. 68. of the *Fœdera*; wherein Henry VI. grants a licence to John Cobbe, freely to work in metals; he having, by philofophical art, found out a method of transferring imperfect metals into perfect gold and filver.

Philosopher's Stone || Philosophizing.

"This pretended fecret, known afterwards by the name of the *Philofopher's ftone* or *powder*, was encouraged by four licences, granted to different projectors during this reign, and at fundry times after, during this century particularly, and in fucceeding times, all over Europe. The frenzy has not entirely ceafed even to this day, although it meets with neither public encouragement nor countenance from men of fober reafon; the projectors having yet found nothing from their airy fchemes in this mode of fearch but certain ruin to their property." See CHEMISTRY.

The fame author, when fpeaking of the commerce of the kingdom, and the wonderful increafe and riches of commercial cities, fpeaks thus: "This is the true philofopher's ftone, fo much fought after in former ages, the difcovery of which has been referved to genius, when ftudying to improve the mechanic arts. Hence a pound of raw materials is converted into ftuffs of fifty times its original value. And the metals too are not, indeed, tranfmuted into gold—they are more: for the labour of man has been able to work the bafer metals, by the ingenuity of art, fo as to become worth more than many times its weight in gold."

PHILOSOPHIC, or PHILOSOPHICAL, fomething belonging to PHILOSOPHY.

PHILOSOPHICAL EGG, among chemifts, a thin glafs body or bubble, of the fhape of an egg, with a long neck or ftem, ufed in digeftions.

PHILOSOPHIZING, rules of. See *NEWTONIAN Philofophy*, N° 16. and the following article.

PHILOSOPHY

1 Definitions of philofophy.

IS a word derived from the Greek, and literally fignifies the *love of wifdom* (A). In its ufual acceptation, however, it denotes a fcience, or collection of fciences, of which the univerfe is the object; and of the term thus employed many definitions have been given, differing from one another according to the different views of their feveral authors. By Pythagoras, philofophy is defined επιστημη των οντων, "the knowledge of things exifting;" by Cicero, after Plato, *fcientia rerum divinarum et humanarum cum CAUSIS*; and by the illuftrious Bacon, *interpretatio naturæ*. Whether any of thefe definitions be fufficiently precife, and at the fame time fufficiently comprehenfive, may be queftioned; but if philofophy in its utmoft extent be capable of being adequately defined, it is not here that the definition fhould be given. "Explanation (fays an acute writer*), is the firft office of a teacher; definition, if it be good, is the laft of the inquirer after truth; but explanation is one thing, and definition quite another." It may be proper, however, to obferve, that the definition given by Cicero is better than that of Pythagoras, becaufe the chief object of the philofopher is to afcertain the *caufes* of things; and in this confifts the difference between his

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* *Tatham's Chart and Scale of Truth*, v. i. p. 8.

(A) The origin ufually attributed to the term *philofophy* has been already affigned in the article PHILOLOGY. M. Chauvin gives it a turn fomewhat different. According to him, the term is derived from φιλια, *defire* or *ftudy*, and σοφια *wifdom*; and therefore he underftands the word to mean *the defire or ftudy of wifdom*; for (fays he) Pythagoras, conceiving that the application of the human mind ought rather to be called *ftudy* than *fcience*, fet afide the appellation of *wife* as too affuming, and took that of *philofopher*.

History of Philosophy.

his studies and those of the natural historian, who merely enumerates phenomena, and arranges them into separate classes.

2
Its objects.

The principal objects of philosophy are, God, nature, and man. That part of it which treats of God is called *theology*; that which treats of nature, *physics* and *metaphysics*; and that which treats of man, *logic* and *ethics*. That these are not separate and independent sciences, but, as Bacon expresses it (B), branches from the same trunk, we shall endeavour to show, after we have given, agreeably to our usual plan, a short history of philosophy from the earliest ages to the present day.

To attempt to assign an *origin* to philosophy, would be ridiculous; for every man endeavours to ascertain the causes of those changes which he observes in nature; and even children themselves are inquisitive after that which produces the sound of their drums and their rattles. Children, therefore, and the most illiterate vulgar, have in all ages been philosophers. But the first people among whom philosophy was cultivated as a profession, was probably the Chaldeans. We certainly read of none earlier; for though we have more authentic accounts of the Hebrews than of any other nation of remote antiquity, and have reason to believe that no people was civilized before them, yet the peculiar circumstances in which they were placed, rendered all philosophical investigation to them useless, and even tended to suppress the very spirit of inquiry. The Egyptians indeed pretended to be the first of nations, and to have spread the blessings of religion and the light of science among every other people; but, from the earliest records now extant, there is reason to believe that the Chaldeans were a civilized and powerful nation before the Egyptian monarchy was founded.

3
Philosophy of the Chaldeans.

Of the Chaldean philosophy much has been said, but very little is known. Astronomy seems to have been their favourite study; and at the era of Alexander's conquest of their country, they boasted that their ancestors had continued their astronomical observations through a period of 470,000 years. Extravagant claims to antiquity have been common in all nations (C). Calisthenes, who attended the Macedonian conqueror, was requested by Aristotle to inform himself concerning the origin of science in Chaldea; and upon examining into the grounds of this report, he found that their observations reached no farther backwards than 1903 years, or 2234 years before the Christian era. Even this is a remoter antiquity than Ptolemy allows to their science; for he mentions no Chaldean observations prior to the era of Nabonassar, or 747 years before Christ. That they cultivated something which they called philosophy at a much earlier period than this, cannot be questioned; for Aristotle †, on the credit of the most ancient records, speaks of the Chaldean magi as prior to the Egyptian priests, who were certainly men of learning before the time of Moses. For any other science than that of the stars, we do not read that the Chaldeans were famous; and this seems to have been cultivated by them merely as the foundation of judicial astrology. Persuading the multitude that all human affairs are influenced by the stars, and professing to be acquainted with the nature and laws of this influence, their *wise men* pretended to calculate nativities, and to predict good and bad fortune *. This was the source of idolatry and various superstitions; and whilst the Chaldeans were given up to such dotages, true science could not be much indebted to their labours. If any credit be due to Plutarch and Vitruvius, who quote Berosus, (see BEROSUS), it was the opinion of the Chaldean *wise men* that an eclipse of the moon happens when that part of its body which is destitute of fire is turned towards the earth. "Their cosmogony, as given by Berosus, and preserved by Syncellus, seems to be this, that all things in the beginning consisted of darkness and water; that a divine power dividing this humid mass, formed the world; and that the human mind is an emanation from the Divine nature †.

† Apud Laert. lib. 1. § 8.

* Sext. Emp. adv. Math. lib. 4. § 2. Strabo, lib. 100. Cic. de Div. lib. 1. § 1.

† Enfield's Hist. Phil. vol. i.

The large tract of country which comprehended the empires of Assyria and Chaldea, was the first peopled region on earth. From that country, therefore, the rudiments of science must have been propagated in every direction through the rest of the world; but what particular people made the earliest figure, after the Chaldeans, in the history of philosophy, cannot be certainly known. The claim of the Egyptians is probably best founded; but as their science was the immediate source of that of the Greeks, we shall defer what we have to say of it on account of the connection between the parent and the offspring, and turn our attention from Chaldean to Indian philosophy, as it has been cultivated from a very early period by the Brachmans and Gymnosophists. We pass over Persia, because we know not of any science peculiar to that kingdom, except the doctrines of the magi, which were religious rather than philosophical; and of them the reader will find some account under the words MAGI, POLYTHEISM, and ZOROASTER.

4
Indian philosophy.

From whatever quarter India received its wisdom, we are certain that its philosophers were held in high repute at a period of very remote antiquity, since they were visited by Pythagoras and other sages of ancient Greece, who travelled in pursuit of knowledge. Yet they seem to have been in that early age, as well as at present, more distinguished for the severity of their manners than for the acquisition of science; and, as Dr Enfield observes, to have more resembled modern monks than ancient

(B) Convenit igitur partiri *philosophiam* in *doctrinas* tres; *doctrinam* de *numine*, *doctrinam* de *naturâ*, *doctrinam* de *homine*. Quoniam autem partitiones *scientiarum* non sunt lineis diversis similes, quæ coeunt ad unum angulum; sed potius ramis arborum, qui conjunguntur in uno trunco, qui etiam truncus ad spatium nonnullum integer est et continuus, antequam se partiatur in ramos. *De aug. Scient.* lib. iii. cap. 1.

(C) This claim of the Babylonians is thus rejected with contempt by Cicero; "Contemnamus Babylonios, et eos, qui è Caucaso cœli signa servantes, numeris, et motibus, stellarum cursus persequuntur; Condemnemus, inquam, hos aut *stultitiæ*, aut *vanitatis*, aut *imprudentiæ*, qui 470 millia annorum, ut ipsi dicunt, monumentis comprehensa continent, et mentiri judicemus, nec *seculorum* reliquorum *judicium*, quod de ipsis futurum sit, *pertimescere*. *De Divinatione*, lib. i. § 19.

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cient philoſophers. The brachmans or bramins, it is well known, are all of one tribe; and the moſt learned of them are in their own language called *Pundits* or *Pandits*. The Greek writers, however, mention a ſociety called *Samanæans*, who, voluntarily devoting themſelves to the ſtudy of divine wiſdom, gave up all private property, committed their children to the care of the ſtate, and their wives to the protection of their relations. This ſociety was ſupported at the public expence; and its members ſpent their time in contemplation, in converſation on divine ſubjects, or in acts of religion.

5 Ingrafted on religion. The philoſophy of the Indians has indeed from the beginning been engrafted on their religious dogmas, and ſeems to be a compound of fanatic metaphyſics and extravagant ſuperſtition, without the ſmalleſt reaſoning of rational phyſics. Very unlike the philoſophers of modern Europe, of whom a great part labour to exclude the agency of mind from the univerſe, the Pandits of Hindoſtan allow no powers whatever to matter, but introduce the Supreme Being as the immediate cauſe of every effect, however trivial. "Brehm, *the Spirit of God*, (ſays one of their moſt revered Bramins), is abſorbed in ſelf-contemplation. The ſame is the mighty Lord, who is preſent in every part of ſpace, whoſe omnipreſence, as expreſſed in the Reig Beid or Rigveda, I ſhall now explain. Brehm is one, and to him there is no ſecond; ſuch is truly Brehm. His omniſcience is ſelf-inſpired or ſelf-intelligent, and its comprehenſion includes every poſſible ſpecies. To illuſtrate this as far as I am able; the moſt comprehenſive of all comprehenſive faculties is omniſcience; and being ſelf-inſpired, it is ſubject to none of the accidents of mortality, *conception*, *birth*, *growth*, *decay*, or *death*; neither is it ſubject to paſſion or vice. To it the three diſtinctions of time, *paſt*, *preſent*, and *future*, are not. To it the three modes of being (D) are not. It is ſeparated from the univerſe, and independent of all. This omniſcience is named *Brehm*. By this omniſcient Spirit the operations of God are enlivened. By this Spirit alſo the 24 powers (E) of nature are animated. How is this? As the eye by the ſun, as the pot by the fire, as iron by the magnet (F), as variety of imitations by the mimic, as fire by the fuel, as the ſhadow by the man, as duſt by the wind, as the arrow by the ſpring of the bow, and as the ſhade by the tree; ſo by this Spirit the world is endued with the powers of intellect, the powers of the will, and the powers of action: ſo that if it emanates from the heart by the channel of the ear, it cauſes the perception of ſounds; if it emanates from the heart by the channel of the ſkin, it cauſes the perception of touch; if it emanates from the heart by the channel of the eye, it cauſes the perception of viſible objects; if it emanates from the heart by the channel of the tongue, it cauſes the perception of taſte; if it emanates from the heart by the channel of the noſe, it cauſes the perception of ſmell. This alſo invigorating the five members of action, and invigorating the five members of perception, and invigorating the five elements, and invigorating the five ſenſes, and invigorating the three diſpoſitions of the mind, &c. cauſes the creation or the annihilation of the univerſe, while itſelf beholds every thing as an indifferent ſpectator*."

* *Preliminary Diſc. to Halhed's Gentoo Laws.*

From this paſſage it is plain that all the motions in the univerſe, and all the perceptions of man, are, according to the Bramins, cauſed by the immediate agency of the Spirit of God, which ſeems to be here conſidered as the ſoul of the world. But it appears from ſome papers in the Aſiatic Reſearches, that the moſt profound of theſe oriental philoſophers, and even the authors of their ſacred books, believe not in the exiſtence of matter as a ſeparate ſubſtance, but hold an opinion reſpecting it very ſimilar to that of the celebrated Berkeley. The Védantis (ſays Sir William Jones), unable to form a diſtinct idea of brute matter independent of mind, or to conceive that the work of Supreme Goodneſs was left a moment to itſelf, imagine that the Deity is ever preſent to his work, and conſtantly ſupports a ſeries of perceptions, which in one ſenſe they call *illuſory*, though they cannot but admit the reality of all created forms, as far as the happineſs of creatures can be affected by them. 6 Admits not the ſeparate exiſtence of matter, and

This is the very immaterialiſm of Berkeley; and in proof that it is the genuine doctrine of the Bramins, the learned preſident quotes the *Bhágavat*, which is believed to have been pronounced by the Supreme Being, and in which is the following ſentence.

"Except the *firſt cauſe*, whatever may appear, and may not appear, in the mind, know that to be the mind's *Máyá*, or 'deluſion,' as light, as darkneſs."

We have ſhown elſewhere (ſee Metaphysics, Nº 269.) that the metaphyſical doctrines of the Bramins, reſpecting the human ſoul, differ not from thoſe of Pythagoras and Plato; and that they believe it to be an emanation from the great ſoul of the world, which, after many tranſmigrations, will be finally abſorbed in its parent ſubſtance. In proof of their believing in the metempſychoſis, Mr Halhed gives us the following tranſlation of what (he ſays) is a beautiful ſtanza in the Geetā: "As throwing aſide his old clothes, a man puts on others that are new; ſo our lives, quitting the old, go to other newer animals." 7 Teaches the metempſychoſis.

8 Phyſics of the Bramins. From the Bramins believing in the ſoul of the world not only as the *ſole agent*, but as the immediate cauſe of every motion in nature, we can hardly ſuppoſe them

(D) To be awake, to ſleep, and to be abſorbed in a ſtate of unconſciouſneſs—a kind of trance.

(E) The 24 powers of nature, according to the Bramins, are the five elements, *fire*, *air*, *earth*, *water*, and *akaſh* (a kind of ſubtile æther); the five members of action, the *hand*, *foot*, *tongue*, *anus*, and *male organ of generation*; the five organs of perception, the *ear*, *eye*, *noſe*, *mouth*, and *ſkin*; the five ſenſes, which they diſtinguiſh from the organs of ſenſation; the three diſpoſitions of the mind, *deſire*, *paſſion*, and *tranquillity*; and the power of *conſciouſneſs*.

(F) If the work from which this extract is quoted be of as great antiquity as Mr Halhed ſuppoſes, the Bramins muſt have been acquainted with the phenomena of magnetiſm at a much earlier period than any other philoſophers of whom hiſtory makes mention.

to have made any great progreſs in that ſcience which in Europe is cultivated under the name of *phyſics*. They have no inducement to inveſtigate the laws of nature; becauſe, according to the firſt principles of their philoſophy, which, together with their religion, they believe to have been revealed from heaven, every phenomenon, however regular, or however anomalous, is produced by the voluntary act of an intelligent mind. Yet if they were acquainted with the uſe of fire-arms 4000 years ago, as Mr Halhed ſeems to believe, he who made that diſcovery muſt have had a very conſiderable knowledge of the powers of nature; for though gunpowder may have been diſcovered by accident in the Eaſt, as it certainly was in the Weſt, it is difficult to conceive how many ages afterwards, it is difficult to conceive how mere accident could have led any man to the invention of a gun.

9
Their aſtronomy.

In aſtronomy, geometry, and chronology too, they appear to have made ſome proficiency at a very early period. (See ASTRONOMY, N° 4.). Their chronology and aſtronomy are indeed full of thoſe extravagant fictions which ſeem to be eſſential to all their ſyſtems; but their calculation of eclipſes, and their computations of time, are conducted upon ſcientific principles.

"It is ſufficiently known (ſays Mr Davis *) that the Hindoo diviſion of the ecliptic into ſigns, degrees, &c. is the ſame as ours; that their aſtronomical year is ſidereal, or containing that ſpace of time in which the ſun, departing from a ſtar, returns to the ſame; that it commences on the inſtant of his entering the ſign Aries, or rather the Hindoo conſtellation Méſha; that each aſtronomical month contains as many even days and fractional parts as he ſtays in each ſign; and that the civil differs from the aſtronomical account of time only in rejecting thoſe fractions, and beginning the year and month at ſunriſe, inſtead of the intermediate inſtant of the artificial day or night. Hence ariſes the unequal portion of time aſſigned to each month dependent on the ſituation of the ſun's apſis, and the diſtance of the vernal equinoctial colure from the beginning of Méſha in the Hindoo ſphere; and by theſe means they avoid thoſe errors which Europeans, from a different method of adjuſting their kalendar by intercalary days, have been ſubject to."

* *Aſiatic Reſearches*, vol. ii.

Mr Davis obſerves, that an explanation of theſe matters would have led him beyond his purpoſe, which was only to give a general account of the method by which the Hindoos compute eclipſes, and to ſhow that the ſcience of aſtronomy is as well known among them now as ever it was among their anceſtors. This he does very completely; but in the preſent ſhort hiſtorical ſketch, we can neither copy nor abridge his memoir. Suffice it to ſay, that he has ſhown the practical part of the Hindoo aſtronomy to be founded on mathematical principles; and that the learned Pandits appear to have truer notions of the form of the earth, and the economy of the univerſe, than thoſe which are aſcribed to their countrymen in general.

The ſame writer ſhows likewiſe, that the prodigious duration which the Hindoos attribute to the world, is the reſult of a ſcientific calculation, founded indeed on very whimſical principles. "It has been common with aſtronomers to fix on ſome epoch, from which, as from a radix, to compute the planetary motions; and the ancient Hindoos choſe that point of time counted back, when, according to their motions as they had determined them, they muſt have been in conjunction in the beginning of Méſha or Aries, and coeval with which circumſtance they ſuppoſed the *creation*. This, as it concerned the planets only, would have produced a moderate term of years compared with the enormous antiquity that will be hereafter ſtated: but having diſcovered a ſlow motion of the nodes and apſides alſo, and taken it into computation, they found it would require a length of time correſponding with 1955884890 years now expired, when they were ſo ſituated, and 2364115110 years more before they would return to the ſame ſituation again, forming together the grand anomaliſtick period denominated a *Calpa*, and fancifully aſſigned as the day of Brahmá."

But though the mathematical part of the aſtronomy of the Pandits is undoubtedly reſpectable, their phyſical notions of the univerſe are in the higheſt degree ridiculous and extravagant. In the Vedas and Puranas, writings of which no devout Hindoo can diſpute the divine authority, eclipſes are ſaid to be occaſioned by the intervention of the monſter *Rahu*; and the earth to be ſupported by a ſeries of animals.

10
Strange notions of the univerſe.

"They ſuppoſe (ſays Mr Halhed) that there are 14 ſpheres, ſeven below and and ſix above the earth. The ſeven inferior worlds are ſaid to be altogether inhabited by an infinite variety of ſerpents, deſcribed in every monſtrous figure that the imagination can ſuggeſt. The firſt ſphere above the earth is the immediate vault of the viſible heavens, in which the ſun, moon, and ſtars, are placed. The ſecond is the firſt paradiſe, and general receptacle of thoſe who merit a removal from the lower earth. The third and fourth are inhabited by the ſouls of thoſe men who, by the practice of virtue and dint of prayer, have acquired an extraordinary degree of ſanctity. The fifth is the reward of thoſe who have all their lives performed ſome wonderful act of penance and mortification, or who have died martyrs for their religion. The higheſt ſphere is the reſidence of Brahma and his particular favourites, ſuch as thoſe men who have never uttered a falſehood during their whole lives, and thoſe women who have voluntarily burned themſelves with their huſbands. All theſe are abſorbed in the divine eſſence."

11
Ethics of the Hindoos.

On ethics, the Hindoos have nothing that can be called philoſophy. Their duties, moral, civil, and religious, are all laid down in their *Vedas* and *Shaſters*; and enjoined by what they believe to be divine authority, which ſuperſedes all reaſoning concerning their fitneſs or utility. The buſineſs of their Pandits is to interpret thoſe books, which are extremely ancient, and written in a language that has long been unintelligible to every other order of men; but no Pandit will alter the text, however impoſſible to be reconciled to principles eſtabliſhed in his own practice of aſtronomy. On ſuch occaſions, the uſual apology for their ſacred books is, that "ſuch things may have been ſo formerly, and may be ſo ſtill; but that for aſtronomical purpoſes, aſtronomical rules muſt be followed *." The great duties of morality have been preſcribed in every religious code; and they are not overlooked in that of the Hindoos, though the higheſt merit that a Bramin can have conſiſts in voluntary acts of abſtinence and mortification, and in contempt of death.

* *Davis's Memoir, Aſiatic Reſearches*, vol. ii.

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12 Philosophy of the Arabians and Chinese.

Of the ancient philosophy of the Arabians and Chinese nothing certain can be said; and the narrow limits of such an abstract as this, do not admit of our mentioning the conjectures of the learned, which contradict each other, and are all equally groundless.

There is indeed sufficient evidence that both nations were at a very early period observers of the stars; and that the Chinese had even a theory by which they foretold eclipses (see ASTRONOMY, N° 2, 3.); but there is reason to believe that the Arabians, like other people in their circumstances, were nothing more than judicial astrologers, who possessed not the smallest portion of astronomical science.

Pliny makes mention of their magi, whilst later writers tell us, that they were famous for their ingenuity in solving enigmatical questions, and for their skill in the arts of divination: but the authors of Greece are silent concerning their philosophy; and there is not an Arabian book of greater antiquity than the Koran extant (See PHILOLOGY, Section II.).

13 Early science of the Phœnicians.

Leaving therefore regions so barren of information, let us pass to the Phœnicians, whose commercial celebrity has induced many learned men to allow them great credit for early science. If it be true, as seems highly probable, that the ships of this nation had doubled the Cape and almost encompassed the peninsula of Africa long before the era of Solomon (See OPHIR, N° 10.), we cannot doubt that the Phœnicians had made great proficiency in the art of navigation, and in the science of astronomy, at a period of very remote antiquity. Nor were these the only sciences cultivated by that ancient people: the learned Cudworth has, in our opinion, sufficiently proved that *Moschus* or *Mochus* a Phœnician, who, according to Strabo, flourished before the Trojan war, was the author of the atomic philosophy afterwards adopted by Leucippus, Democritus, and others among the Greeks; and that it was with some of the successors of this sage that Pythagoras, as Jamblichus tells us, conversed at Sidon, and from them received his doctrine of *Monads* (See PYTHAGORAS). Another proof of the early progress of the Phœnicians in philosophy may be found in the fragments of their historian Sanchoniatho which have been preserved by Eusebius *. We are indeed aware that men of great celebrity have called in question the authenticity of those fragments, and even the very existence of such a writer as Sanchoniatho; but for this scepticism we can discover no foundation (See SANCHONIATHO). His history may have been interpolated in some places by the translator Philo-Byblius; but Porphyry, Eusebius, and Theodoret, speak of it as a work of undoubted credit, and affirm that its author flourished before the Trojan war. Now this ancient writer teaches that, according to the *wise men* of his country, all things arose at first from the necessary agency of an active principle upon a passive chaotic mass which he calls *mot*. This chaos Cudworth thinks was the same with the elementary *water* of Thales, who was also of Phœnician extraction; but Mosheim justly observes that it was rather *dark air*, since Philo translates it *ἀερα ζοφωδη*. Be this as it may, nothing can be more evident than that the Phœnicians must have made some progress in what must surely be considered as philosophy, however false, so early as the era of Sanchoniatho; for speculations about the origin of the world never occur to untaught barbarians. Besides Mochus and Sanchoniatho, Cadmus, who introduced letters into Greece, may undoubtedly be reckoned among the Phœnician philosophers; for though it is not pretended that the alphabet was of his invention, and though it is by no means certain that the Greeks, at the time of his arrival among them, were wholly destitute of alphabetic characters (See PHILOLOGY, N° 130.); yet the man who could prevail with illiterate savages to adopt the use of strange characters, must have been a great master of the science of human nature. Several other Phœnician philosophers are mentioned by Strabo; but as they flourished at a later period, and philosophized after the systematic mode of the Greeks, they fall not properly under our notice. We pass on therefore to the philosophy of Egypt.

* Prep. Ev.

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It has been already observed that the Egyptians boasted of being the first of nations, and the authors of all the science which in separate rays illuminated the rest of the world. But though this claim was undoubtedly ill-founded, their high antiquity and early progress in the arts of civil life cannot be controverted. The Greeks with one voice confess that all their learning and wisdom came from Egypt, either imported immediately by their own philosophers, or brought through Phœnicia by the sages of the east; and we know from higher authority than the histories of Greece, that at a period so remote as the birth of Moses, the wisdom of the Egyptians was proverbially famous. Yet the history of Egyptian learning and philosophy, though men of the first eminence both ancient and modern have bestowed much pains in attempts to elucidate it, still remains involved in clouds of uncertainty. That they had some knowledge of physiology, arithmetic, geometry, and astronomy, are facts which cannot be questioned; but there is reason to believe that even these sciences were in Egypt pushed no farther than to the uses of life. That they believed in the existence of incorporeal substances is certain; because Herodotus assures us that they were the first assertors of the immortality, pre-existence, and transmigration of human souls, which they could not have been without holding those souls to be at least *incorporeal*, if not *immaterial*. 14 Egyptian philosophy.

The author of Egyptian learning is generally acknowledged to have been *Thoth*, *Theut*, or *Taaut*, called by the Greeks *Hermes*, and by the Romans *Mercury*; but of this personage very little is known. Diodorus Siculus says that he was chief minister to Osiris, and that he improved language, invented letters, instituted religious rites, and taught astronomy, music, and other arts. The same thing is affirmed by *Sanchoniatho*, whose antiquity has been already mentioned; by *Manetho* an Egyptian priest, who flourished during the reign of Ptolemy Philadelphus; and by Plato, whose authority, as he resided long in Egypt, and was himself an eminent philosopher, is perhaps more to be depended upon than that of the other two. In the Philebus we are told that Thoth was the inventor of letters; and lest we should suppose that by those letters nothing more is meant than picture writing or symbolical hieroglyphics, it is added, that he distinguished between *vowels* and *consonants*, determining the number of each. The same philosopher, in his Phædrus, attributes to Thoth the invention of *arithmetic*, *geometry*, *astronomy*, and *hieroglyphic* learning; and subjoins a disputation

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diſputation ſaid to have been held between him and *Thamus* then king of Egypt, concerning the advantage and diſadvantage of his newly invented letters. Thoth boaſted that the invention, by aiding memory, would greatly contribute to the progreſs of ſcience; whilſt the monarch contended, that it would enervate men's natural faculties by making them truſt to written characters without exerting the powers of their own minds.

All this, if real, muſt have happened before the era of Moſes; and ſince it is almoſt certain that alphabetical characters were in uſe prior to the *exod* of the Iſraelites from Egypt (ſee PHILOLOGY, N° 24, 25.) we may as well allow the invention to Thoth, as give it to an earlier author of unknown name. That arithmetic, geometry, and aſtronomy, were cultivated in Egypt from the moſt remote antiquity, is affirmed by all the ancients, and made in the higheſt degree probable by the ſituation of the country. The firſt elements of aſtronomy have certainly been diſcovered by various nations, whoſe habits of life led them to the frequent obſervation of the heavens; and it is obſerved by Cicero, that the Egyptians and Babylonians, dwelling in open plains where nothing intercepted the view of the heavenly bodies, naturally devoted themſelves to the ſtudy of that ſcience. The annual overflowing of the Nile, which broke up the boundaries of their land, would lay the Egyptians under the neceſſity of adopting ſome method of ſettling thoſe boundaries anew; and neceſſity we know to be the parent of invention. Hence their early acquaintance with practical geometry cannot well be doubted. Their cuſtom of embalming their dead, and the perfection to which they carried that art (G), ſhows infallibly their knowledge of the properties of natural ſubſtances, and gives ſome reaſon to believe that they were not altogether ſtrangers to anatomy: but if we allow them to have been at this early period anatomiſts acquainted with the power of drugs, we can hardly refuſe them ſome ſkill in the art of phyſic, which they themſelves traced up to their gods and demigods, to *Serapis*, *Iſis*, and her ſon *Horus* or *Apollo*.

The art of alchymy has been ſaid to have been known by the ancient Egyptians; and from the author of the Egyptian philoſophy it has been called the *Hermetic* art. But though this is unqueſtionably a fiction, there is evidence that they were poſſeſſed of one art which is even yet a *deſideratum* in the practice of chemiſtry. "Moſes (we are told *) took the golden calf, which his brother had made for idolatrous purpoſes, and *burnt it in the fire*, and *ground it to powder*, and ſtrewed it on the water, and made the children of Iſrael drink of it." Had this fact been related by Herodotus or Diodorus Siculus, it would have been deemed ſufficient evidence that the Egyptians were even at that early period no ſtrangers to the art of chemiſtry: and ſurely the evidence ſhould not be the worſe for coming from the pen of the Hebrew lawgiver, who was himſelf educated in the court of Egypt.

* Exod. xxxii. 20.

15 Not carried to high perfection.

But though it is thus evident that the rudiments of almoſt every uſeful ſcience were known in Egypt from the remoteſt antiquity, it does not appear that any of them was carried to a great degree of perfection, unleſs perhaps chemiſtry alone muſt be excepted. One would think that no ſcience could have been more indiſpenſably requiſite to them than geometry. And yet though Pythagoras is ſaid to have ſpent 22 years in Egypt ſtudying that ſcience and aſtronomy, he himſelf diſcovered (H) the famous 47th Prop. of Euclid's firſt book after his return to Samos. This, though a very uſeful, is yet a ſimple theorem; and ſince it was not reached by the Egyptian geometry, we cannot ſuppoſe that thoſe people had then advanced far in ſuch ſpeculations. The ſame concluſion muſt be drawn with reſpect to aſtronomy; for Thales is ſaid to have been the firſt that calculated an eclipſe of the ſun; and we nowhere read that the *Egyptians* pretended to diſpute that honour with him.

16 Their knowledge of the ſolar ſyſtem.

To this it may be replied, that Pythagoras was in Egypt undoubtedly taught the true conſtitution of the ſolar ſyſtem, and what is more extraordinary, the doctrine of comets in particular, and of their revolutions, like the other planets, round the ſun (I). We grant that he was taught all this; but it was not ſcientifically, but dogmatically, as facts which the prieſts had received by tradition from their early anceſtors, and of which they had never queſtioned the truth nor enquired into the reaſons. Of this we need no better proof than that the Pythagorean ſyſtem of the ſun was totally neglected by the Greeks as ſoon as they began to frame hypotheſes and to ſpeculate in philoſophy (K).

But

(G) It is true that the diſſection of ſome mummies has leſſened the high opinion long entertained of the ſkill of the ancient Egyptians in the art of embalming; yet it muſt be granted that their knowledge of antiſeptic drugs was great, ſince it is now certainly known, even from theſe diſſections, that by means of ſuch drugs they contrived to preſerve rags of cloth from corruption for upwards of 3000 years.

(H) This diſcovery he claimed; and his claim was admitted by the Greek writers without having been *directly* controverted ſince. An excellent mathematician, however, has ſhown that the equality between the ſquare of the hypothenuſe of a right-angled triangle, and the ſum of the ſquares on the other two ſides, was known to the aſtronomers of India at a period long prior to that of Pythagoras. Notwithſtanding this, it is certainly poſſible that the ſage of Samos may have made the diſcovery himſelf, though we think the contrary much more probable; for we agree with the able writer already mentioned, that Pythagoras, who is generally believed to have converſed with Indian brahmans as well as Egyptian prieſts, may have derived from them "ſome of the ſolid as well as the viſionary ſpeculations with which he delighted to inſtruct or amuſe his diſciples." See *Tranſactions of the Royal Society of Edinburgh*, vol. ii. Memoir xiii. Phyſic Claſs.

(I) This is recorded by Ariſtotle and Plutarch; and thus expreſſed by Ammianus Marcellinus.—"Stellas quaſdam, *ceteris ſimiles*, quarum *ortus orbituſque*, quibus ſint temporibus *præſtituti* humanis mentibus ignorari, lib. xxv. cap. 10.

(K) *Fixas* in ſupremis mundi partibus immotas perſiſtere, et planetas his inferiores circa ſolem revolvi, terram pariter moveri curſu annuo, diurno vero circa axem propriam, et ſolem ceu focum univerſi in omnium centro quieſcere,

History of Philosophy.

But it may seem strange, and certainly is so, that the Egyptian priests, in the days of Pythagoras, should have preserved so great a discovery of their ancestors, and at the same time have totally forgotten the principles and reasoning which led to a conclusion apparently contrary to the evidence of sense. This is a difficulty which we pretend not to remove, though the fact which involves it seems to be beyond the reach of controversy. Perhaps the following observations may throw upon it a feeble light. According to Manetho, the written monuments of the first Thoth were lost or neglected in certain civil revolutions or natural calamities which befel the kingdom of Egypt. After many ages great part of them were recovered by an ingenious interpretation of the symbols which he had inscribed upon ancient columns; and the man who made this interpretation was called the second *Thoth* or *Hermes Trismegistus*. But *thrice illustrious* as this personage was, it is at least possible that he may have been much inferior to the former Hermes, and have read his writings and transcribed his conclusions without being able to comprehend the principles or reasoning which led to those conclusions. Any man who understands Latin might translate into his own tongue the conclusions of Newton; but much more would be requisite to make him comprehend the demonstrations of his sublime geometry. By what mode of reasoning the first Hermes (I) was led to the true idea of the solar system, or whether it was by reasoning at all, cannot now be known; but it seems very evident, that when the intercourse between the Egyptians and Greeks first commenced, the wisdom of the former people consisted chiefly in the science of legislation and civil policy, and that the philosopher, the divine, the legislator, and the poet, were all united in the same person. Their cosmogony (for all the ancients who pretended to science framed cosmogonies) differed little from that of the Phœnicians already mentioned. They held that the world was produced from chaos by the energy of an intelligent principle; and they likewise conceived that there is in nature a continual tendency towards dissolution. In Plato's Timæus, an Egyptian priest is introduced describing the destruction of the world, and asserting that it will be effected by means of water and fire. They conceived that the universe undergoes a periodical conflagration; after which all things are restored to their original form, to pass again through a similar succession of changes.

17 Their moral science. *Enfield's History of Philosophy.*

"Of preceptive doctrine the Egyptians had two kinds, the one sacred, the other vulgar. The former, which respected the ceremonies of religion and the duties of the priests, was doubtless written in the sacred books of Hermes, but was too carefully concealed to pass down to posterity. The latter consisted of maxims and rules of virtue, prudence, or policy. Diodorus Siculus relates many particulars concerning the laws, customs, and manners of the Egyptians; whence it appears that superstition mingled with and corrupted their notions of morals. It is in vain to look for accurate principles of ethics among an ignorant and superstitious people. And that the ancient Egyptians merited this character is sufficiently evident from this single circumstance, that they suffered themselves to be deceived by impostors, particularly by the professors of the fanciful art of astrology; concerning whom Sextus Empiricus justly remarks, that they have done much mischief in the world, by enslaving men to superstition, which will not suffer them to follow the dictates of right reason." See EGYPT, MYSTERIES, MYTHOLOGY, &c.

18 Grecian philosophy.

From Egypt and Phœnicia philosophy passed into Greece; where it was long taught without system, as in the countries from which it was derived. Phoroneus, Cecrops, Cadmus, and Orpheus, were among the earliest instructors of the Greeks; and they inculcated Egyptian and Phœnician doctrines in detached maxims, and enforced them, not by strength of argument, but by the authority of tradition. Their cosmogonies were wholly Phœnician or Egyptian, disguised under Grecian names; and they taught a future state of rewards and punishments. The planets and the moon Orpheus conceived to be habitable worlds, and the stars to be fiery bodies like the sun: but he taught that they are all animated by divinities; an opinion which prevailed both in Egypt and the east: and it does not appear that he gave any other proof of his doctrines than a confident assertion that they were derived from some god. See ORPHEUS.

Hitherto

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cere, antiquissima fuit philosophantium sententia. Ab Ægyptiis autem astrorum antiquissimis observationibus propagatam esse hanc sententiam verisimile est. Et etiam ab illis et à gentibus conterminis ad Græcos, gentem magis philologicam quam philosophicam, philosophia omnis antiquior juxta et senior manasse videtur. Subinde docuerunt Anaxagoras, Democritus, et alii nonnulli, terram in centro mundi immotam stare, et astra omnia in occasum, aliqua celerius, alia tardius moveri, idque in spatiis liberrimis. Namque orbis solidi postea ab Eudoxo, Calippo, Aristotele, introducti sunt; declinante indies philosophia primitus introducta, et novis Græcorum commentis paulatim prævalentibus. Quibus *vinculis* ANTIQUI planetas in spatiis liberis retineri, deque cursu rectilineo perpetuo retractas in orbem regulariter agi docuere, non constat. *Newton de Mundi Systemate.*

(I) Some authors, deeply skilled in the Hebrew language, have thought that the true system of the sun and planets may be perceived in the Scriptures of the Old Testament, and that it is only from the ignorance or carelessness of the translators that it does not appear in the English bible and other versions. The writer of this article confesses that his knowledge of the Hebrew is very limited, which is probably the reason that to him the arguments of these men appear weak and their criticisms fanciful. No man, however, has a higher veneration than he for the sacred volume, which he believes to have been given for nobler purposes than to teach its readers the science of astronomy; but could the principles of that science be found in it, he should be strongly inclined to think that the first Thoth was Joseph, and that the monarch to whom he was minister was the far-famed Osiris. Were there any solid foundation for this supposition, it would be easy to conceive how Thoth acquired his science, and how the Egyptian priests might retain just notions of the solar system in general, long after they had forgotten the evidence upon which he communicated those notions to their ancestors.

History of Philoſophy.

Hitherto we have ſeen philoſophy in its ſtate of infancy and childhood, conſiſting only of a collection of ſententious maxims and traditionary opinions; but among the Greeks, an ingenious and penetrating people, it ſoon aſſumed the form of profound ſpeculation and ſyſtematic reaſoning. Two eminent philoſophers aroſe nearly at the ſame period, who may be conſidered as the parents not only of Grecian ſcience, but of almoſt all the ſcience which was cultivated in Europe prior to the era of the great Lord Bacon: Theſe were Thales and Pythagoras; of whom the former founded the Ionic ſchool and the latter the Italic; from which two ſprung the various ſects into which the Greek philoſophers were afterwards divided. A bare enumeration of theſe ſects is all that our limits will admit of; and we ſhall give it in the perſpicuous language and juſt arrangement of Dr Enfield, referring our readers for a fuller account than we can give of their reſpective merits to his abridged tranſlation of Brucker's hiſtory.

19 The Ionic ſchool.

Of the IONIC SCHOOL were, 1. The Ionic ſect proper, whoſe founder Thales had as his ſucceſſors Anaximenes, Anaxagoras, Diogenes Apolloniates, and Archelaus. 2. The Socratic ſchool, founded by Socrates, the principal of whoſe diſciples were Xenophon, Æſchines, Simon, Cebes, Ariſtippus, Phædo, Euclid, Plato, Antiſthenes, Critias, and Alcibiades. 3. The Cyrenaic ſect, of which Ariſtippus was the author: his followers were, his daughter Arete, Hegiſias, Anicerris, Theodorus, and Bion. 4. The Megaric or Eriſtic ſect, formed by Euclid of Megara; to whom ſucceeded Eubulides, Diodorus, and Stilpo, famous for their logical ſubtlety. 5. The Eliac or Eretriac ſchool, raiſed by Phædo of Elis, who, though he cloſely adhered to the doctrine of Socrates, gave name to his ſchool. His ſucceſſors were Pliſtanus and Menedemus; the latter of whom, being a native of Eretria, transferred the ſchool and name to his own country. 6. The Academic ſect, of which Plato was the founder. After his death, many of his diſciples deviating from his doctrine, the ſchool was divided into the old, new, and middle academies. 7. The Peripatetic ſect, founded by Ariſtotle, whoſe ſucceſſors in the Lyceum were Theophraſtus, Strato, Lycon, Ariſto, Critolaus, and Diodorus. Among the Peripatetics, beſides thoſe who occupied the chair, were alſo Dicæarchus, Eudemus, and Demetrius Phalereus. 8. The Cynic ſect, of which the author was Antiſthenes, whom Diogenes, Oneſicritus, Crates, Metrocles, Menipus, and Menedemus, ſucceeded. In the liſt of Cynic philoſophers muſt alſo be reckoned Hipparchia, the wife of Crates. 9. The Stoic ſect, of which Zeno was the founder. His ſucceſſors in the porch were Perſæus, Ariſto of Chios, Herillus, Sphærus, Cleanthus, Chryſippus, Zeno of Tarſus, Diogenes the Babylonian, Antipater, Panætius, and Poſidonius.

20 The Italic ſchool.

Of the ITALIC SCHOOL were, 1. The Italic ſect proper: it was founded by Pythagoras, a diſciple of Pherecydes. The followers of Pythagoras were Ariſtæus, Mneſarchus, Alcmæon, Ecphantus, Hippo, Empedocles, Epicharmus, Ocellus, Timæus, Archytas, Hippaſus, Philolaus, and Eudoxus. 2. The Eleatic ſect, of which Xenophanes was the author: his ſucceſſors, Parmenides, Meliſſus, Zeno, belonged to the metaphyſical claſs of this ſect; Leucippus, Democritus, Protagoras, Diagoras, and Anaxarchus, to the phyſical. 3. The Heraclitean ſect, which was founded by Heraclitus, and ſoon afterwards expired: Zeno and Hippocrates philoſophiſed after the manner of Heraclitus, and other philoſophers borrowed freely from his ſyſtem. 4. The Epicurean ſect, a branch of the Eleatic, had Epicurus for its author; among whoſe followers were Metrodorus, Polyænus, Hermachus, Polyſtratus, Baſilides, and Protarchus. 5. The Pyrrhonic or Sceptic ſect, the parent of which was Pyrrho: his doctrine was taught by Timon the Phliaſian; and after ſome interval was continued by Ptolemy a Cyrenean, and at Alexandria by Æneſidemus.

Of the peculiar doctrines of theſe ſects, the reader will in this work find a ſhort account either in the lives of their reſpective founders, or under the names of the ſects themſelves. We ſhall only obſerve at preſent, that though many of them were undoubtedly abſurd, and many wicked, it would yet perhaps be going too far to ſay with ſome, that the philoſophy of Greece became impious under Diagoras, vicious under Epicurus, HYPOCRITICAL UNDER ZENO, impudent under Diogenes, covetous under Demochares, voluptuous under Metrodorus, fantaſtical under Crates, ſcurrilous under Menippus, licentious under Pyrrho, and quarrelſome under Cleanthes. Of the truth of this heavy charge every reader muſt judge for himſelf. We are ſtrongly inclined to think, that there were virtues and vices peculiar to each ſect; "and that the ſects themſelves had an affinity more or leſs direct with the different temperaments of man; whence the choice of ſectators often depended on phyſical influence, or a peculiar diſpoſition of their organs. Nothing appears more natural than that thoſe men who were born with great force of mind and ſtrong nerves ſhould diſcover a predilection for ſtoiciſm; while mortals, endowed by nature with more delicacy of fibres and keener ſenſibility, fled for refuge to the myrtles of Epicurus. People whoſe temperaments partook of no extremes, were always inclined either for the Lyceum or the Academy. Such as poſſeſſed ſolidity of underſtanding ranged themſelves with Ariſtotle; and thoſe who had only genius, or even pretenſions to that endowment, went to augment the crowd of Platoniſts."

Pauw's Philoſophical Diſſertation, &c.

21 Grecian mode of philoſophizing.

All the ſyſtematical philoſophers, however, purſued their inquiries into nature by nearly the ſame method. Of their philoſophy, as well as of ours, the univerſe, with all that it contains, was the vaſt object; but the individual things which compoſe the univerſe are infinite in number and ever changing; and therefore, according to an eſtabliſhed maxim of theirs, incapable of being the ſubjects of human ſcience *. To reduce this infinitude, and to fix thoſe fleeting beings, they eſtabliſhed certain definite arrangements or claſſes, to ſome of which every thing paſt, preſent, or to come, might be referred; and having aſcertained, as they thought, all that could be affirmed or denied of theſe claſſes, they proved, by a very ſhort proceſs of ſyllogiſtic reaſoning, that what is true of the claſs muſt be true of every individual comprehended under it. The moſt celebrated of theſe arrangements is that which is known by the name of *categories*; which Mr Harris thinks at leaſt as old as the era of Pythagoras, and to the forming of which mankind would, in his opinion, be neceſſarily led by the following conſiderations: Every ſubject of human thought is either *ſubſtance* or *attribute*; but *ſubſtance* and *attribute* may each of them be

* *Boeth. in Prædic. et Ariſt. Phyſic. lib. i.*

22 The categories.

be modified under the different characters of *univerſal* or *particular*. Hence there ariſes a quadruple arrangement of things into *ſubſtance univerſal* and *ſubſtance particular*; into *attribute univerſal* and *attribute particular*; to ſome one of *which four* not only our words and ideas, but every individual of that immenſe multitude of things which compoſe the univerſe, may be deduced. This arrangement, however, the learned author thinks too limited; and he is of opinion, that, by attending to the ſubſtances with which they were ſurrounded, the Grecian ſchools muſt ſoon have diſtinguiſhed between the attributes *eſſential* to all ſubſtances and thoſe which are only *circumſtantial*; between the attributes proper to *natural* ſubſtances or bodies, and thoſe which are peculiar to *intelligible* ſubſtances or minds. He likewiſe thinks, that the *time* and *place* of the exiſtence of ſubſtances not preſent, muſt ſoon have attracted their attention; and that in conſidering the place of this or that ſubſtance, they could hardly avoid thinking of its *poſition* or *ſituation*. He is of opinion, that the ſuperinduction of one ſubſtance upon another would inevitably ſuggeſt the idea of *clothing* or *habit*, and that the variety of *co-exiſting ſubſtances* and *attributes* would diſcover to them another attribute, viz. that of *relation*. Inſtead therefore of confining themſelves to the ſimple diviſion of *ſubſtance* and *attribute*, they divided *attribute* itſelf into nine diſtinct ſorts, ſome *eſſential* and others *circumſtantial*; and thus by ſetting ſubſtance at their head, made ten *comprehenſive univerſal genera*, called, with reference to their Greek name, *categories*, and with reference to their Latin name *predicaments*. Theſe categories are, SUBSTANCE, QUALITY, QUANTITY, RELATION, ACTION, PASSION, WHEN, WHERE, POSITION, and HABIT; which, according to the ſyſtematic philoſophy of the Greeks, comprehend every human ſcience and every ſubject of human thought. *Hiſtory*, natural and civil, ſprings, ſays Mr Harris, out of SUBSTANCE; *mathematics* out of QUANTITY; *optics* out of QUALITY and QUANTITY; *medicine* out of the *ſame*; *aſtronomy* out of QUANTITY and MOTION; *muſic* and *mechanics* out of the *ſame*; *painting* out of QUALITY and SITE; *ethics* out of RELATION; *chronology* out of WHEN; *geography* out of WHERE; *electricity*, *magnetiſm*, and *attraction*, out of ACTION and PASSION; and ſo in other inſtances.

To theſe categories, conſidered as a mere arrangement of ſcience, we are not inclined to make many objections. The arrangement is certainly not complete: but this is a matter of comparatively ſmall importance; for a complete arrangement of ſcience cannot, we believe, be formed. The greateſt objection to the categories ariſes from the uſe that was made of them by almoſt every philoſopher of the Grecian ſchools; for thoſe ſages having reduced the objects of all human ſcience to ten general heads or general terms, inſtead of ſetting themſelves to inquire by a painful induction into the nature and properties of the real objects before them, employed their time in conceiving what could be predicated of *ſubſtance* in general, of this or that

23 and predicables.

quality, *quantity*, *relation*, &c. in the abſtract: and they ſoon found, that of ſuch general conceptions as the *categories* there are but five *predicables* or claſſes of *predicates* in nature. The firſt claſs is that in which the *predicate* is the *genus* of the *ſubject*; the ſecond, that in which it is the *ſpecies* of the *ſubject*; the third, is when the *predicate* is the *ſpecific difference* of the *ſubject*; the fourth, when it is a *property* of the *ſubject*; and the fifth, when it is ſomething *accidental* to the *ſubject* (ſee LOGIC, Part II. chap. ii. and iii.). Having proceeded thus far in their ſyſtem, they had nothing to do with individuals but to arrange them under their proper categories, which was commonly done in a very arbitrary manner; and then, with the formality of a ſyllogiſm, to predicate of each the predicable of the genus or ſpecies to which it belonged. But by this method of proceeding, it is obvious that no progreſs whatever could be made in phyſical, metaphyſical, or ethical ſcience; for if the individual truly belongs to the category under which it is arranged, we add nothing to our ſtock of knowledge by affirming or denying of it what we had before affirmed or denied of the whole genus: and if it belong not to the category under which we arrange it, our ſyllogiſing will only give the appearance of proof to what muſt, from the nature of things, be an abſolute falſehood. It is only by experiments made on various ſubſtances apparently of the ſame kind that they can be certainly known to belong to the ſame category; and, when this is done, all ſyllogiſtic reaſoning from the genus to the ſpecies, and from the ſpecies to the individual, is but ſolemn trifling, as every propoſition in this retrograde courſe takes for granted the thing to be proved.

24 are no inſtruments of ſcience.

25 This philoſophy diſſeminated through the whole world;

Yet this mode of philoſophizing ſpread from Greece almoſt over the whole world. It was carried by Alexander into Aſia, by his ſucceſſors into Egypt; and it found its way to Rome after Greece became a province of the empire. It was adopted by the Jews, by the fathers of the Chriſtian church, by the Mahommedan Arabs during the caliphate, and continued to be cultivated by the ſchoolmen through all Europe, till its futility was expoſed by Lord Bacon (M). The profeſſors of this philoſophy often diſplayed great acuteneſs; but their ſyſtems were built on mere hypotheſes, and ſupported by ſyllogiſtic wrangling. Now and then indeed a ſuperior genius, ſuch as Alhazen and our countryman, Roger Bacon, broke through the trammels of the ſchools, and, regardleſs of the authority of the Stagyrite and his *categories*, made real diſcoveries in phyſical ſcience by experiments judiciouſly conducted on individual ſubſtances (ſee BACON, *Roger*; and OPTICS, N° 6.); but the ſcience in repute ſtill continued to be that of *Generals*.

It was indeed a combination of abſurd metaphyſics with more abſurd theology; and that which is properly called *phyſics*, had in Europe no place in a liberal education from the end of the eighth century to the end of the fourteenth. Towards the beginning of this period of darkneſs, the whole circle of inſtruction, or the

(M) Scientiæ, quas habemus, fere à Græcis fluxerunt. Quæ enim ſcriptores Romani, aut Arabes, aut recentiores addiderunt, non multa, aut magni momenti ſunt: et qualiacunque ſint, fundata ſunt ſuper baſin eorum quæ inventa ſunt à Græcis. *Bacon.*

History of Philoſophy.

the liberal arts as they were called, conſiſted of two branches, the *trivium* and the *quadrivium*; of which the former comprehended *grammar*, *rhetoric*, and *dialectics*; the latter *muſic*, *arithmetic*, *geometry*, and *aſtronomy*, to which was added about the end of the eleventh century the ſtudy of a number of *metaphyſical ſubtleties* equally uſeleſs and unintelligible.

Hitherto the works of the ancient Greek philoſophers had been read only in imperfect Latin tranſlations; and before the ſcholaſtic ſyſtem was completely eſtabliſhed, Plato and Ariſtotle had been alternately looked up to as the oracle in ſcience. The rigid ſchoolmen, however, univerſally gave the preference to the Stagyrite; becauſe his analyſis of body into matter and form is peculiarly calculated to keep in countenance the moſt incredible doctrine of the Romiſh church (ſee TRANSUBSTANTIATION): and upon the revival of Greek learning, this preference was continued after the ſchool philoſophy had begun to fall into contempt, on account of much uſeful information contained in ſome of his writings on ſubjects of natural hiſtory, and his ſuppoſed merit as a natural philoſopher. At laſt the intrepid ſpirit of Luther and his aſſociates ſet the minds of men free from the tyranny of ancient names, as well in human ſcience as in theology; and many philoſophers ſprung up in different countries of Europe, who profeſſed either to be *eclectics*, or to ſtudy nature, regardleſs of every authority but that of reaſon. Of theſe the moſt eminent beyond all compariſon was Francis Bacon Lord Verulam.

26 expoſed as futile by Lord Bacon;

This illuſtrious man having read with attention the writings of the moſt celebrated ancients, and made himſelf maſter of the ſciences which were then cultivated, ſoon diſcovered the abſurdity of pretending to account for the phenomena of nature by ſyllogiſtic reaſoning from hypothetical principles; and with a boldneſs becoming a genius of the firſt order, undertook to give a new chart of human knowledge. This he did in his two admirable works, intitled, 1. *De dignitate et augmentis ſcientiarum*; and, 2. *Novum organum ſcientiarum*, ſive *Judicia vera de interpretatione Naturæ*. In the former of theſe works, he takes a very minute ſurvey of the whole circle of human ſcience, which he divides into three great branches, *hiſtory*, *poetry*, and *philoſophy*, correſponding to the three faculties of the mind, *memory*, *imagination*, and *reaſon*. Each of theſe general heads is ſubdivided into minuter branches, and reflections are made upon the whole, which, though we can neither copy nor abridge them, will amply reward the peruſal of the attentive reader.

27 who eſtabliſhes a better method of inquiry.

The purpoſe of the *Novum Organum* is to point out the proper method of interpreting nature; which the author ſhows can never be done by the logic which was then in faſhion, but only by a painful and fair induction. "Homo naturæ miniſter (ſays he) et interpres tantum facit et intelligit, quantum de naturæ ordine re, vel mente obſervaverit; nec amplius ſcit aut poteſt. Syllogiſmus ad principia ſcientiarum non adhibetur, ad media axiomata fruſtra adhibetur, cum ſit ſubtilitati naturæ longe impar. Aſſenſum itaque conſtringit, non res. Syllogiſmus ex propoſitionibus conſtat, propoſitiones ex verbis, verba notionum teſſeræ ſunt. Itaque ſi notiones ipſæ (id quod baſis rei eſt) confuſæ ſint et temere à rebus abſtractæ, nihil in iis quæ ſuperſtruuntur, eſt firmitudinis. Itaque ſpes eſt una in *inductione vera*."

View of Bacon's Philoſophy.

To hypotheſes and preconceived opinions, which he calls *idola theatri*, this great man was not leſs inimical than to ſyllogiſms; and ſince his days almoſt every philoſopher of eminence, except Deſcartes and his followers (ſee DESCARTES and CARTESIANS), has profeſſed to ſtudy nature according to the method of induction ſo accurately laid down in the *Novum Organum*. On this method a few improvements have perhaps been made; but notwithſtanding theſe, Lord Bacon muſt undoubtedly be conſidered as the author of that philoſophy which is now cultivated in Europe, and which will continue to be cultivated as long as men ſhall have more regard for matters of fact than for hypothetical opinions. Of this mode of philoſophiſing we ſhall now give a ſhort, though we hope not inaccurate, view, by ſtating its objects, comparing it with that which it ſuperſeded, explaining its rules, and pointing out its uſes; and from this view it will appear, that its author ſhares with Ariſtotle the empire of ſcience.

28 View of his philoſophy.

THE univerſe, that unbounded object of the contemplation, the curioſity and the reſearches of man, may be conſidered in two different points of view.

In the firſt place, it may be conſidered merely as a collection of exiſtences, related to each other by means of reſemblances and diſtinction, ſituation, ſucceſſion, and derivation, as making parts of a whole. In this view it is the ſubject of pure deſcription.

To acquire an acquaintance with, or a knowledge of, the univerſe in this point of view, we muſt enumerate all the beings in it, mention all their ſenſible qualities, and mark all theſe relations for each. But this would be labour immenſe; and when done, an undiſtinguiſhable chaos. A book containing every word of a language would only give us the materials, ſo to ſpeak, of this language. To make it comprehenſible, it muſt be put into ſome form, which will comprehend the whole in a ſmall compaſs, and enable the mind to paſs eaſily from one word to another related to it. Of all relations among words, the moſt obvious are thoſe of reſemblance and derivation. An etymological dictionary, therefore, in which words are claſſed in conſequence of their reſemblances, and arranged by means of their derivative diſtinctions, will greatly facilitate the acquiſition of the language.

Juſt ſo in nature: The objects around us may be grouped by means of their reſemblance, and then arranged in thoſe groups by means of their diſtinctions and other relations. In this claſſification we are enabled to proceed by means of our faculty of abſtracting our attention from the circumſtances in which things differ, and turning it to thoſe only in which they agree. By the judicious employment of this faculty we are able not only to diſtribute the individuals into claſſes, but alſo to diſtribute thoſe claſſes into others ſtill more comprehenſive, by diſcovering circumſtances of reſemblance among them: for the fewer the circumſtances are which concur to form that reſemblance which has engaged our attention, the greater is the number of diſſimilar circumſtances which are neglected; and the more extenſive will be the claſs of individuals in which the reſemblance is obſerved.

29 Natural hiſtory.

Thus a number of individuals reſembling each other in the

ſingle circumſtance of life, compoſes the moſt extenſive KINGDOM of ANIMALS. If it be required, that they ſhall further reſemble in the circumſtance of having feathers, a prodigious number of animals are excluded, and we form the inferior *claſs* of BIRDS. We exclude a great number of birds, by requiring a further ſimilarity of web feet, and have the *order* of ANSERES. If we add lingua ciliata, we confine the attention to the *genus* of ANATES. In this manner may the whole objects of the univerſe be grouped, and arranged into kingdoms, claſſes, orders, genera, and ſpecies.

Such a claſſification and arrangement is called NATURAL HISTORY; and muſt be conſidered as the only foundation of any extenſive knowledge of nature. To the natural hiſtorian, therefore, the world is a collection of exiſtences, the ſubject of deſcriptive arrangement. His aim is threefold.

1. To obſerve with care, and deſcribe with accuracy, the various objects of the univerſe.

2. To determine and enumerate all the great claſſes of objects; to diſtribute and arrange them into all their ſubordinate claſſes, through all degrees of ſubordination, till he arrive at what are only accidental varieties, which are ſuſceptible of no farther diſtribution; and to mark with preciſion the principles of this diſtribution and arrangement, and the characteriſtics of the various aſſemblages.

3. To determine with certainty the particular group to which any propoſed INDIVIDUAL belongs.

DESCRIPTION, therefore, ARRANGEMENT, and REFERENCE, conſtitute the whole of his employment; and in this conſiſts all his ſcience.

30 diſtinguiſhed from philoſophy.

Did the univerſe continue unchanged, this would conſtitute the whole of our knowledge of nature: but we are witneſſes of an uninterrupted ſucceſſion of changes, and our attention is continually called to the EVENTS which are inceſſantly happening around us. Theſe form a ſet of objects vaſtly more intereſting to us than the former; being the ſources of almoſt all the pleaſures or pains we receive from external objects.

We are therefore much intereſted in the ſtudy of the events which happen around us, and ſtrongly incited to proſecute it: but they are ſo numerous and ſo multifarious, that the ſtudy would be immenſe, without ſome contrivance for abbreviating and facilitating the taſk. The ſame help offers itſelf here as in the ſtudy of what may be called *quieſcent nature*. Events, like exiſtences, are ſuſceptible of claſſification, in conſequence of reſemblances and diſtinction; and by attention to theſe, we can acquire a very extenſive acquaintance with active nature. Our attention muſt be chiefly directed to thoſe circumſtances in which many events reſemble each other, while they differ perhaps in a thouſand others. Then we muſt attend to their moſt general diſtinctions; then to diſtinctions of ſmaller extent, and ſo on.

It is in this way accordingly that we have advanced in our knowledge of active nature, and are gradually, and by no means ſlowly, forming aſſemblages of events more and more extenſive, and diſtributing theſe with greater and greater preciſion into their different claſſes.

In the zealous and attentive proſecution of this taſk a very remarkable and intereſting obſervation occurs: In deſcribing thoſe circumſtances of ſimilarity among events, and particularly in diſtributing them according to thoſe ſimilarities, it is impoſſible for us to overlook that conſtancy which is obſerved in the changes of nature in the events which are the objects of our contemplation. Events which have once been obſerved to accompany each other are obſerved always to do ſo.

31 Conſtancy in the changes of nature

The riſing of the ſun is always accompanied by the light of day, and his ſetting by the darkneſs of night. Sound argument is accompanied by conviction, impulſe by motion, kindneſs by a feeling of gratitude, and the perception of good by deſire. The unexcepted experience of mankind informs us, that the events of nature go on in certain regular trains; and if ſometimes exceptions ſeem to contradict this general affirmation, more attentive obſervation never fails to remove the exception. Moſt of the ſpontaneous events of nature are very complicated; and it frequently requires great attention and penetration to diſcover the ſimple event amidſt a crowd of uneſſential circumſtances which are at once exhibited to our view. But when we ſucceed in this diſcovery, we never fail to acknowledge the perfect uniformity of the event to what has been formerly obſerved.

32 univerſally expected.

But this is not all: We firmly *believe* that this uniformity will *ſtill continue*; that fire will melt wax, will burn paper, will harden clay, as we have formerly obſerved it to do; and whenever we have undoubted proofs that the circumſtances of ſituation are preciſely the ſame as in ſome former caſe, though but once obſerved, we expect with irreſiſtible and unſhaken confidence that the event will alſo be the ſame.

It is not ſurely neceſſary to adduce many proofs of the univerſality of this law of human thought. The whole language and actions of men are inſtances of the fact. In all languages there is a mode of conſtruction which is uſed to expreſs this relation as diſtinct from all others, and the converſation of the moſt illiterate never confounds them, except when the conceptions themſelves are confounded. The general employment of the active and paſſive verb is regulated by it. *Turris everſa eſt à militibus; turris everſa eſt terræ motu*, expreſs two relations, and no ſchoolboy will confound them. The diſtinction therefore is perceived or felt by all who can ſpeak grammatically. Nor is any language without general terms to expreſs this relation, cauſe—effect—to occaſion. Nay, it is a fact in the mind of brutes, who hourly ſhow that they expect the ſame uſes of every ſubject which they formerly made of it; and without this, animals would be incapable of ſubſiſtence, and man incapable of all improvement. From this alone memory derives all its value; and even the conſtancy of natural operation would be uſeleſs if not matched or adapted to our purpoſes by this expectation of any confidence in that conſtancy.

After all the labours of ingenious men to diſcover the foundation of this irreſiſtible expectation, we muſt be contented with ſaying that ſuch is the conſtitution of the human mind. It is an *univerſal fact* in human thought; and for any thing that has been yet diſcovered, it is an *ultimate* fact, not included in any other ſtill more general. We ſhall ſoon ſee that this is ſufficient for making it the foundation of true human knowledge; all of which muſt in like manner be reduced to ultimate facts in human thought.

We muſt conſider this undoubted feeling, this perſuaſion of the conſtancy of nature, as an *inſtinctive* anticipation of events ſimilar to thoſe which we have already

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already experienced. The general analogy of nature should have disposed philosophers to acquiesce in this, however unwelcome to their vanity. In no instance of essential consequence to our safety or well-being are we left to the guidance of our boasted reason; God has given us the surer conduct of natural instincts. No case is so important as this: In none do we so much stand in need of a guide which shall be powerful, infallible, and rapid in its decisions. Without it we must remain incapable of all instruction from experience, and therefore of all improvement.

Our sensations are undoubtedly feelings of our mind. But all those feelings are accompanied by an instinctive reference of them to something distinct from the feelings themselves. Hence arises our perception of external objects and our very notions of this externeity (pardon the term). In like manner, this anticipation of events, this irresistible connection of the idea of fire with the idea of burning, is also a feeling of the mind: and this feeling is by a law of human nature referred, without reasoning, to something external as its cause; and, like our sensation, it is considered as a *sign* of that external something. It is like the conviction of the truth of a mathematical proposition. This is referred by us to something existing in nature, to a necessary and eternal relation subsisting between the ideas which are the subjects of the proposition. The conviction is the sign or indication of this relation by which it is brought to our view. In precisely the same manner, the irresistible connection of ideas is interpreted as the sensation or sign of a *necessary connection* of external things or events. These are supposed to include something in their nature which renders them inseparable companions. To this bond of connection between external things we

33 Our knowledge of causation.

give the name of CAUSATION. All our knowledge of this relation of cause and effect, is the knowledge or consciousness of what passes in our own minds during the contemplation of the phenomena of nature. If we adhere to this view of it, and put this branch of knowledge on the same footing with those called the *abstract sciences*, considering only the *relations* of ideas, we shall acquire *demonstrative science*. If we take any other view of the matter, we shall be led into inextricable mazes of uncertainty and error.

We see then that the natural procedure of our faculty of abstraction and arrangement, in order to acquire a more speedy and comprehensive knowledge of natural events, presents them to our view in another form. We not only see them as *similar* events, but as events naturally and necessarily *conjoined*. And the expression of *resemblance* among events is also an expression of *concomitancy*; and this arrangement of events in consequence of their resemblance is in fact the *discovery* of those accompaniments. The trains of natural appearance being considered as the appointments of the Author of Nature, has occasioned them to be considered also as consequences of *laws* imposed on his works by their great author, and every thing is said to be regulated by fixed laws. But this is the lan-

34 Laws of nature explained.

guage of analogy. When a sovereign determines on certain trains of conduct for his subjects, he issues his orders. These orders are laws. He inforces the observance of them by his authority; and thus a certain regularity and constancy of conduct is produced. But should a stranger, ignorant of the promulgation of these laws, and of the exerted authority of the magistrate, observe this uniformity of conduct, he would ascribe it to the genius and disposition of the people; and his observation would be as useful to him for directing the tenor of his own conduct, as the knowledge of the subject himself of the real source of this constancy is for directing his.

Just so in nature, while the theologian pretends, from his discoveries concerning the existence and superintendance of God, to know that the constant accompaniment of events is the consequence of laws which the great Author and Governor of the universe has imposed on his works, the ordinary philosopher, a stranger to this scene, and to the unsearchable operations of the SUPREME MIND, must ascribe this constancy to the nature of the things. There is a great resemblance between the expression *natural law* and *grammatical rule*. Rule in strict language implies command; but in grammar it expresses merely a generality of *fact*, whether of flexion or construction. In like manner, a LAW OF NATURE is to the philosopher nothing but the expression of a generality of fact. A natural or physical law is a generally observed fact; and whenever we treat any subject as a generally observed fact, we treat it physically. It is a physical law of the understanding that argument is accompanied by conviction; it is a physical law of the affection that distress is accompanied by pity; it is a physical law of the material world that impulse is accompanied by motion.

And thus we see that the arrangement of events, or the discovery of those general points of resemblance, is in fact the discovery of the laws of nature; and one of the greatest and most important is, that the laws of nature are constant.

There is no question that this view of the universe is incomparably more interesting and important than that which is taken by the natural historian; contemplating every thing that is of value to us, and, in short, the whole life and movement of the universe. This study, therefore, has been dignified with the name of PHILOSOPHY and of SCIENCE; and natural history has been considered as of importance only in so far as it was conducive to the successful prosecution of philosophy. 35 Object of philosophy.

But the philosopher claims a superiority on another account: he considers himself as employed in the discovery of causes, saying that philosophy is the study of the objects of the universe as related by causation, and that it is by the discovery of these relations that he communicates to the world such important knowledge. Philosophy, he says, is the science of causes. The vulgar are contented to consider the prior of two inseparably conjoined events as the cause of the other; the stroke on a bell, for instance, as the cause of sound. But it has been clearly shown by the philosopher, that between the blow on the bell and the sensation of sound there are interposed a long train of events. The blow sets the bell a trembling; this agitates the air in contact with the bell; this agitates the air immediately beyond it; and thus between the bell and the ear may be interposed a numberless series of events, and as many more between the first impression on the ear and that last impression on the nerve by which the mind is affected. He can no longer therefore follow the nomenclature of the vulgar. Which of the events of this train therefore is the cause of the sensation? None of 36 Causes.

them;

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them: It is that *something* which inseparably connects any two of them, and constitutes their bond of union. These bonds of union or causes he considers as residing in one or both of the connected objects: diversities in this respect must therefore constitute the most important distinctions between them. They are therefore with great propriety called the *qualities*, the *properties* of these respective subjects.

As the events from which we infer the existence of these qualities of things resemble in many respects such events as are the consequences of the exertion of our own powers, these qualities are frequently denominated POWERS, forces, energies. Thus, in the instance just now given of the sound of a bell, we infer the powers of impulse, elasticity, nervous irritability, and animal sensibility.

In consequence of this inference of a necessary connection between the objects around us, we not only infer the posterior event from the prior, or, in common language, the effect from the cause, but we also infer the prior from the posterior, the cause from the effect. We not only expect that the presence of a magnet will be followed by certain motions in iron-filings, but when

37 inferred from effects.

we observe such motions, we infer the presence and agency of a magnet. Joy is inferred from merriment, poison from death, fire from smoke, and impulse from motion. And thus the appearances of the universe are the indications of the powers of the objects in it. Appearances are the language of nature, informing us of their causes. And as all our knowledge of the sentiments of others is derived from our confidence in their veracity; so all our knowledge of nature is derived from our confidence in the constancy of natural operations. A veracity and credulity necessarily resulting from that law of our mental constitution by which we are capable of speech, conduct us in the one case; and the constancy of nature, and the principle of induction, by which we infer general laws from particular facts, conduct us in the other. As human sentiment is inferred from language, and the existence of external things from sensation; so are the laws of nature, and the powers of natural objects, inferred from the phenomena. It is by the successful study of this language of nature that we derive useful knowledge. The knowledge of the influence of motives on the mind of man enables the statesman to govern kingdoms, and the knowledge of the powers of magnetism enables the mariner to pilot a ship through the pathless ocean.

Such are the lofty pretensions of philosophy. It is to be wished that they be well founded; for we may be persuaded that a mistake in this particular will be fatal to the advancement of knowledge. An author of great reputation † gives us an opportunity of deciding this question in the way of experiment. He says that the ancients were philosophers, employed in the discovery

38 Discoveries of Aristotle and Newton compared.

of causes, and that the moderns are only natural historians, contenting themselves with observing the laws of nature, but paying no attention to the causes of things. If he speak of their *professed* aim, we apprehend that the assertion is pretty just in general. With very few exceptions indeed it may be affirmed of his favourite Aristotle, the philosopher κατ' ἐξοχην, and of Sir Isaac Newton. We select these two instances, both because they are set in continual opposition by this author, and because it will be allowed that they were the most eminent students of nature (for we must not yet call them philosophers) in ancient and modern times. Aristotle's professed aim, in his most celebrated writings, is the investigation of causes; and in the opinion of this author, he has been so successful, that he has hardly left any employment for his successors beside that of commenting upon his works. We must on the other hand acknowledge that Newton makes no such pretensions, at least in that work which has immortalized his name, and that his professed aim is merely to investigate the *general* laws of the planetary motions, and to apply these to the explanation of particular phenomena. Nor will we say that he has left no employment for succeeding inquirers; but, on the contrary, confess that he has only begun the study, has discovered but one law, and has enabled us to explain only the phenomena comprehended in it alone. But he has not been unsuccessful; his investigation has been complete; and he has discovered, beyond all possibility of contradiction, a *fact* which is observed through the whole extent of the solar system; namely, that every body, nay, that every particle in it, is continually DEFLECTED toward every other body; and that this deflection is, in every instance, proportional to the quantity of matter in that body toward which the deflection is directed, and to the reciprocal of the square of the distance from it. He has therefore discovered a physical law of immense extent. Nor has he been less successful in the explanation of particular phenomena. Of this there cannot be given a better instance than the explanation of the lunar motions from the theory of gravity begun by Newton "Mathesi sua facem praeferente;" and now brought to such a degree of perfection, that if the moon's place be computed from it for any moment within the period of two thousand years back, it will not be found to differ from the place on which she was actually observed by one hundredth part of her own breadth.

Discimus hinc tandem qua causa argentea Phœbe
Passibus haud æquis eat, et cur, subdita nulli
Hactenus astronomo, numerorum frena recusat.
Quæ toties animos veterum torsere sophorum,
Quæque scholas hodie rauco certamine vexant,
Obvia conspicimus, nube pellente mathesi;
Qua superos penetrare domos, et ardua cœli
Newtoni auspiciis jam dat contingere templa.

We may now desire the champions of the science of causes to name any one cause which has really been discovered by their great master, whether in the operations of mind or of body. But they must not on this occasion adduce the investigation of any natural law in which he has sometimes succeeded. With still greater confidence may we challenge them to produce any remarkable instance of the explanation of natural phenomena either of mind or body. By explanation we mean an account of the production, and an appreciation of all the circumstances, susceptible of a scrupulous comparison with fact, and perfectly consistent with it. It is here that the weakness of this philosopher's pretensions is most conspicuous; and his followers candidly acknowledge, that in the inquiries which proceed by experiment, we have not derived great assistance from Aristotle's philosophy. But this, say they, does not derogate from the pre-eminence of his philosophy, because he has shown that the *particular* fields of observation are to be cultivated only by means of experiment. But surely every field of *observation* is particular. There is no *abstract*

† *Ancient Metaphysics.*

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abſtract object of philoſophical reſearch, the ſtudy of which ſhall terminate in the philoſophy of univerſals. In every kind of inquiry, that cauſe alone muſt be ſuppoſed to act which we underſtand ſo far as to be able to appreciate its effects in particular circumſtances, and compare them with fact, and ſee their perfect coincidence. If we have diſcovered cauſes, they are *known* as far as they are diſcovered. Their genuine effects are known, and therefore the phenomena which reſult from their agency are underſtood. When therefore it is acknowledged, as it muſt be acknowledged, that mankind have made but little advances in the knowledge of nature, notwithſtanding the pretended diſcovery of cauſes by Ariſtotle, and the conducting clue of his philoſophy, till of late years; and when it is alſo allowed that *now*, while we are every day making great additions to this ſubordinate knowledge, the cauſes which Ariſtotle has diſcovered are forgotten, and his philoſophy is neglected; there is great room for ſuſpecting (to ſay the leaſt), that either the cauſes which philoſophy pretends to have diſcovered are not real, or that Ariſtotle and his followers have not aimed at the diſcovery of cauſes, but only at the diſcovery of natural laws, and have failed in the attempt.

39 Philoſophical cauſes diſcovered

There ſeems here to be a previous queſtion: *Is it poſſible to diſcover a philoſophical cauſe*, that ſomething which is neither the prior nor the poſterior of the two *immediately* adjoining events, but their bond of union, and this diſtinct from the union itſelf? It is evident that this is an inquiry purely experimental. It is of *human knowledge* we ſpeak. This muſt depend on the nature of the human mind. This is a matter of contingency, known to us only by experiment and obſervation. By obſerving all the feelings and operations of the mind, and claſſing and arranging them like any other object of ſcience, we diſcover the general laws of human thought and human reaſoning; and this is all the knowledge we can ever acquire of it, or of any thing elſe.

Much has been written on this ſubject. The moſt acute obſervation and ſound judgment have been employed in the ſtudy; and we may venture to ſay, that conſiderable progreſs has been made in pneumatology. Many laws of human thought have been obſerved, and very diſtinctly marked; and philoſophers are buſily employed, ſome of them with conſiderable ſucceſs, in the diſtribution of them into ſubordinate claſſes, ſo as to know their comparative extent, and to mark their diſtinguiſhing characters with a preciſion ſimilar to what has been attained in botany and other parts of natural hiſtory; ſo that we may hope that this ſtudy will advance like others. But in all theſe reſearches, no phenomena have occurred which look like the perception or contemplation of theſe ſeparate objects of thought, theſe philoſophical cauſes, this POWER in abſtracto. No philoſopher has ever pretended to ſtate ſuch an object of the mind's obſervation, or attempted to group them into claſſes.

40 in the events.

We may ſay at once, without entering into any detail, that thoſe cauſes, thoſe bonds of neceſſary union between the naturally conjoined events or objects, are not only perceived *by means* of the events alone, but are perceived ſolely *in* the events, and cannot be diſtinguiſhed from the conjunctions themſelves. They are neither the objects of ſeparate obſervation, nor the productions of memory, nor inferences drawn from reflection on the laws by which the operation of our own minds are regulated; nor can they be derived from other perceptions in the way of argumentative inference. We cannot infer the paroxyſm of terror from the appearance of impending deſtruction, or the fall of a ſtone when not ſupported, as we infer the incommenſurability of the diagonal and ſide of a ſquare. This laſt is *implied* in the very conception or notion of a ſquare; not as a conſequence of its other properties, but as one of its eſſential attributes: and the contrary propoſition is not only falſe, but incapable of being diſtinctly conceived. This is not the caſe with the other phenomenon, or any matter of fact. The proofs which are brought of a mathematical propoſition, are not the reaſon of its being true, but the ſteps by which this truth is brought into our view; and frequently, as in the inſtance now given, this truth is perceived, not directly, but conſequentially, by the inconceivableneſs of the contrary propoſition.

41 Mr Hume's theory a *petitio principii*.

Mr Hume derives this irreſiſtible expectation of events from the known effect of cuſtom, the aſſociation of ideas. The corelated event is brought into the mind by this well known power of cuſtom, with that vivacity of conception which conſtitutes belief or expectation. But without inſiſting on the futility of his theory of belief, it is ſufficient to obſerve, that this explanation begs the very thing to be proved, when it aſcribes to cuſtom a *power* of any kind. It is the origin of this very power which is the ſubject in diſpute. Beſides, on the genuine principles of ſcepticiſm, this cuſtom involves an acknowledgement of paſt events, of a ſomething different from preſent impreſſions, which, in this doctrine (if doctrine it can be called), are the only certain exiſtences in nature: and, laſtly, it is known that *one* clear experience is a ſufficient foundation for this unſhaken confidence and anticipation. General cuſtom can never, on Mr Hume's principles, give ſuperior vivacity to any particular idea.

42 Another hypotheſis reſpecting cauſal connection.

This certain nonentity of it as a ſeparate object of obſervation, and this impoſſibility to derive this notion of neceſſary and cauſal connection between the events of the univerſe from any ſource, have induced two of the moſt acute philoſophers of Europe, Mr Leibnitz and Father Malebranche, to deny that there is any ſuch connection, and to aſſert that the events of the univerſe go on in correſponding trains, but without any cauſal connection, juſt as a well-regulated clock will keep time with the motions of the heavens without any kind of dependence on them. This harmony of events was pre-eſtabliſhed by the Author of the Univerſe, in ſubſerviency to the purpoſes he had in view in its formation.

All thoſe purpoſes which are cognizable by us, may certainly be accompliſhed by this perfect adjuſtment. But without inſiſting on the fantaſtic wildneſs of this ingenious whim, it is quite enough to obſerve, that it alſo is a begging of the queſtion, becauſe it ſuppoſes cauſation when it aſcribes all to the agency of the Deity.

Thus have we ſearched every quarter, without being able to find a ſource from which to derive this perception of a neceſſary connection among the events of the univerſe, or of this confident expectation of the continuance of phyſical laws; and yet we are certain of the feeling, and of the perſuaſion, be its origin what it may: for we ſpeak intelligibly on this ſubject; we ſpeak familiarly of cauſe, effect, power, energy, neceſſary connection, motives and their influence, argument and conviction,

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viction, reasons and persuasion, allurements and emotions, of gravity, magnetism, irritability, &c.; and we carry on conversations on these subjects with much entertainment and seeming instruction. Language is the expression of thought, and every word expresses some notion or conception of the mind; therefore it must be allowed, that we have such notions as are expressed by cause, power, energy. But it is here, as in many cases, we perceive a distinction without being able to express it by a definition; and that we do perceive the relation of causation as distinct from all others, and in particular as distinct from the relation of contiguity in time and place; or the relation of agent, action, and patient, must be concluded from the uniformity of language, which never confounds them except on purpose, and when it is perceived. But even here we shall find, that none of the terms used for expressing those powers of substance which are conceived as the causes of their characteristic phenomena, really express any thing different from the phenomena themselves. Let any person try to define the terms gravity, elasticity, sensibility, and the like, and he will find that the definition is nothing but a description of the phenomenon itself. The words are all derivatives, most of them verbal derivatives, implying action, gravitation, &c. As the general resemblances in shape, colour, &c. are expressed by the natural historian by generic terms, so the general resemblances in event are expressed by the philosopher in generic propositions, which, in the progress of cultivation, are also abbreviated into generic terms.

This abundantly explains the consistency of our language on this subject, both with itself and with the operations of nature, without however affording any argument for the truth of the assumption, that causes are the objects of philosophic research as separate existences; or that this supposed necessary connection is a *necessary truth*, whether supreme or subordinate. But since the perception of it has its foundation in the constitution of the human mind, it seems intitled to the name of a *first principle*. We are hardly allowed to doubt of this, when we consider the importance of it, and the care of nature to secure us in all things essential to our safety and well-being, from all danger, from inattention, ignorance, or indolence, by an instinct infallible in its information, and instantaneous in its decisions. "It would not be like her usual care (says Hume), if this operation of the mind, by which we infer like effects from like causes, and *vice versa*, were entrusted to the fallacious deduction of our reason, which is slow in its operations, appears not in any degree during the first years of infancy, and in every age and period of human life is extremely liable to error. It is more conformable to her *ordinary caution* (mark the acknowledgment) to secure so necessary an act of the mind by some instinct, or blind tendency, which may be infallible and rapid in all its operations, may discover itself at the first appearance of life, and may be independent of all the laboured deductions of reason. As she has taught us the use of our limbs, without giving us any knowledge of the nerves and muscles by which they are actuated; so she has implanted in us an instinct, which carries forward the thought in a course conformable to that established among external objects, though we be ignorant of the powers and forces on which this regularity depends."

43 The perception of this connection a first principle.

Such a knowledge is quite unnecessary, and therefore causes are no more cognoscible by our intellectual powers than colours by a man born blind; nay, whoever will be at the pains to consider this matter agreeably to the received rules and maxims of logic, will find that necessary connection, or the bond of causation, can no more be the subject of philosophical discussion by man, than the ultimate nature of truth. It is precisely the same absurdity or incongruity, as to propose to examine light with a microscope. Other rational creatures may perceive them as easily as we hear sounds. All that we can say is, that their existence is probable, but by no means certain. Nay, it may be (and we may never know it) that we are not the efficient causes of our own actions, which may be effected by the Deity or by ministering spirits; and this may even be true in the material world. But all this is indifferent to the real occupation of the philosopher, and does not affect either the certainty, the extent, or the utility of the knowledge which he may acquire.

44 The object of the philosopher the discovery of physical laws.

We are now able to appreciate the high pretensions of the philosopher, and his claim to scientific superiority. We now see that this can neither be founded on any scientific superiority of his object, nor of his employment. His object is not causes; and his discoveries are nothing but the discovery of general facts, the discovery of physical laws: and his employment is the same with that of the descriptive historian. He observes and describes with care and accuracy the events of nature; and then he groups them into classes, in consequence of resembling circumstances, detected in the midst of many others which are dissimilar and occasional. By gradually throwing out more circumstances of resemblance, he renders his classes more extensive; and, by carefully marking those circumstances in which the resemblance is observed, he characterises all the different classes: and, by a comparison of these with each other, in respect to the number of resembling circumstances, he distributes his classes according to their generality and subordination; thus exhausting the whole assemblage, and leaving nothing unarranged but accidental varieties. In this procedure it is to be remarked, that every grouping of similar events is, *ipso facto*, discovering a general fact, a physical law; and the expression of this assemblage is the expression of the physical law. And as every observation of this constancy of fact affords an opportunity for exerting the instinctive inference of natural connection between the related subjects, every such observation is the discovery of a power, property, or quality, of natural substance. And from what has been said, this observation of event is all we know of the connection, all we know of the natural power. And when the philosopher proceeds farther to the arrangement of events, according to their various degrees of complication, he is, *ipso facto*, making an arrangement of all natural powers according to their various degrees of subordinate influence. And thus his occupation is perfectly similar to that of the descriptive historian, classification and arrangement; and this constitutes all the science attainable by both.

45 Philosophy defined.

PHILOSOPHY may therefore be defined, the study of the phenomena of the universe, with a view to discover the general laws which indicate the powers of natural substances, to explain subordinate phenomena, and to improve

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improve art: Or, in compliance with that natural instinct so much spoken of, Philosophy is the study of the phenomena of the universe, with a view to discover their causes, to explain subordinate phenomena, and to improve art.

The task is undoubtedly difficult, and will exercise our noblest powers. The employment is manly in itself, and the result of it important. It therefore justly merits the appellation of *philosophy*, although its objects are nowise different from what occupy the attention of other men.

46 The employment of the philosopher.

The employment of the philosopher, like that of the natural historian, is threefold; DESCRIPTION, ARRANGEMENT, and REFERENCE; while the objects are not *things* but *events*.

The description, when employed about events, may be more properly termed *history*. A philosophical history of nature consists in a complete or copious enumeration and narration of facts, properly selected, cleared of all unnecessary or extraneous circumstances, and accurately narrated. This constitutes the materials of philosophy. We cannot give a better example of this branch of philosophical occupation than astronomy.

From the beginning of the Alexandrian school to this day, astronomers have been at immense pains in observing the heavenly bodies, in order to detect their true motions. This has been a work of prodigious difficulty: for the appearances are such as might have been exhibited although the real motions had been extremely different. Not that our senses give us false information; but we form hasty, and frequently false judgments, from these informations; and call those things deceptions of sense, which are in fact errors of judgment. But the true motions have at last been discovered, and have been described with such accuracy, that the history may be considered as nearly complete. This is to be found in the usual systems of astronomy, where the tables contain a most accurate and synoptical account of the motion; so that we can tell with precision in what point of the heavens a planet *has been* seen at any instant that can be named.

Sir Isaac Newton's Optics is such another perfect model of philosophical history, as far as it goes. This part of philosophy may be called PHENOMENOLOGY.

47 Phenomenology.

Having in this manner obtained the materials of philosophical description, we must put them into a compendious and perspicuous form, so that a general knowledge of the universe may be easily acquired and firmly retained. This is to be done by classification and arrangement, and this classification must proceed on resemblances *observed* in the events; and the subsequent arrangement must be regulated by the distinctions of which those resemblances are still susceptible. This assemblage of events into groups must be expressed. They are facts; therefore the expression must be propositions. These propositions must be what the logicians call *general* or *abstract propositions*; for they express, not any individual fact of the assemblage, but that circumstance in which they all resemble. Such propositions are the following: Proof is accompanied by belief; kindness is accompanied by gratitude; impulse is accompanied by motion.

48 Investigation.

These are usually called *general facts*; but there are none such; every fact is individual. This language, however inaccurate, is very safe from misconstruction, and we may use it without scruple. These propositions are NATURAL or PHYSICAL LAWS; and then the detecting and marking those resemblances in event, is the investigation of physical laws; and we may denominate this employment of the philosopher INVESTIGATION.

In the prosecution of this task, it will be found that the similarities of fact are of various extent: and thus we shall form physical laws of various extent; and we shall also find that some are subordinate to others; for the resemblance of a number of facts in one circumstance does not hinder a part of them from also resembling in another circumstance: and thus we shall find subordinations of fact in the same way as of quiescent qualities. And it is found here, as in natural history, that our assemblage of resembling events will be the more extensive as the number of resembling circumstances is smaller; and thus we shall have kingdoms, classes, orders, genera, and species of phenomena, which are expressed by physical laws of all those different ranks.

It has been already observed, that this observation of physical laws is always accompanied by a reference of that uniformity of event to a natural bond of union between the concomitant facts which is conceived by us as the *cause* of this concomitancy; and therefore this procedure of the philosopher is considered as the discovery of those causes, that is, the discovery of those powers of natural substances which constitute their physical relations, and may justly be called their distinguishing *qualities* or *properties*. This view of the matter gives rise to a new nomenclature and language. We give to those powers generic names, such as *sensibility*, *intelligence*, *irritability*, *gravity*, *elasticity*, *fluidity*, *magnetism*, &c. These terms, without exception, mark resembling circumstances of event; and no other definition can be given of them but a description of these circumstances. In a few cases which have been the subjects of more painful or refined discussion, we have proceeded farther in this abbreviation of language.

We have framed the verb "to gravitate," and the verbal noun "gravitation," which purely expresses the fact, the phenomenon; but is conceived to express the *operation* or energy of the cause or natural power. It is of importance to keep in mind this metaphysical remark on these terms; for a want of attention to the pure meaning of the words has frequently occasioned very great mistakes in philosophical science. 49 Aitiology.

We may with propriety call this part of the philosopher's employment AITIOLOGY.

We shall give an instance of its most successful application to the class of events already adduced as an example of philosophic history or phenomenology.

Kepler, a celebrated Prussian astronomer, having maturely considered the phenomena recorded in the tables and observations of his predecessors, discovered, amidst all the varieties of the planetary motions, three circumstances of resemblance, which are now known by the name of *Kepler's laws*. 50 Kepler's laws an instance.

1. All the planets describe ellipses, having the sun in one focus.

2. The elliptic areas described by a planet in the different parts of its orbit, are proportional to the times of description.

3. The squares of the periodic times are proportional to the cubes of the mean distances from the sun.

By this obſervation or diſcovery, the ſtudy of the planetary motions was greatly promoted, and the calculation of their appearances was now made with a facility and an accuracy which ſurpaſſed all hopes: for the calculation of the place of a planet at any propoſed inſtant was reduced to the geometrical problem of cutting off an area from an ellipſe of known dimenſions, which ſhould bear the ſame proportion to the whole area, as the time for whoſe duration the motion is required, has to the known time of a complete revolution.

51 Comprehended under one more general law,

Long after this diſcovery of Kepler, Sir Iſaac Newton found that theſe laws of Kepler were only particular caſes of a fact or law ſtill more general. He found that the deflections of the planets from uniform rectilineal motion were all directed to the ſun; and that the ſimultaneous deflections were inverſely proportional to the ſquares of the diſtances from that body.

Thus was eſtabliſhed a phyſical law of vaſt extent: but further obſervation ſhowed him, that the motion of every body of the ſolar ſyſtem was compounded of an original motion of projection, combined with a deflection towards every other body; and that the ſimultaneous deflections were proportional to the quantity of matter in the body towards which they were directed, and to the reciprocal of the ſquare of the diſtance from it. Thus was the law made ſtill more general. He did not ſtop here. He compared the deflection of the moon in her orbit with the ſimultaneous deflection of a ſtone thrown from the hand, and deſcribing a parabola; and he found that they followed the ſame law, that is, that the deflection of the moon in a ſecond, was to that of the ſtone in the ſame time, as the ſquare of the ſtone's diſtance from the centre of the earth, to the ſquare of the moon's diſtance from it. Hence he concluded, that the deflection of a ſtone from a ſtraight line was juſt a particular inſtance of the deflections which took place through the whole ſolar ſyſtem.

52 called *gravitation.*

The deflection of a ſtone is one of the indications it gives of its being *gravis* or heavy; whence he calls it *gravitation*. He therefore expreſſes the phyſical law which obtains through the whole ſolar ſyſtem, by ſaying that "every body *gravitates* to every other body; and the gravitations are proportional to the quantity of matter in that other body, and inverſely proportional to the ſquare of the diſtance from it."

Thus we ſee how the arrangement of the celeſtial phenomena terminated in the diſcovery of phyſical laws; and that the expreſſion of this arrangement is the law itſelf.

Since the fall of a heavy body is one inſtance of the phyſical law, and ſince this fall is conſidered by all as the effect of its *weight*, and this weight is conſidered as the cauſe of the fall, the ſame cauſe is aſſigned for all the deflections obſerved in the ſolar ſyſtem; and all the matter in it is found to be under the influence of this cauſe, or to be heavy: and thus his doctrine has been denominated the *ſyſtem of univerſal gravitation*.

Philoſophers have gone farther, and have ſuppoſed that gravity is a power, property, or quality, reſiding in all the bodies of the ſolar ſyſtem. Sir Iſaac Newton does not expreſsly ſay ſo, at leaſt in that work where he gives an account of theſe diſcoveries. He contents himſelf with the immediate conſequence of the firſt axiom in natural philoſophy, viz. that every body remains in a ſtate of reſt, or of uniform rectilineal motion, unleſs affected by ſome moving force. Since the bodies of the ſolar ſyſtem are neither in a ſtate of reſt, nor of uniform rectilineal motion, they muſt be conſidered as ſo affected; that is, that there operates on every one of them a moving force, directed towards all the others, and having the proportions obſerved in the deflection.

53 Attempts to include this law under impulſe.

Other philoſophers have endeavoured to ſhow, that this general fact, detected by Sir Iſaac Newton, is included in another ſtill more general, viz. that every body moves which is impelled by another body in motion. They aſſert, that all the bodies of the ſolar ſyſtem are continually impelled by a fluid which they call *ether*, which is moving in all places, and in all directions, or in circular vortices, and hurries along with it the planets and all heavy bodies. It would ſeem that the familiarity of motion produced by impulſe, at leaſt in thoſe inſtances in which our own exertions are moſt employed, has induced philoſophers to adopt ſuch notions; perhaps, too, they are influenced by an obſcure and indiſtinct notion affixed to the term action, as applied to changes in the material world, and which has given riſe to an axiom, "that a body cannot act at a diſtance, or where it is not;" and thus have thought themſelves obliged to look out for an immediate and contiguous agent in all thoſe phenomena.

54 whilſt impulſe itſelf is never obſerved.

But the philoſophers who profeſs to be moſt ſcrupulous in their adherence to the rules of philoſophic diſcuſſion, deny the legitimacy of this pretended inveſtigation of cauſes, ſaying that this doctrine is in direct oppoſition to the procedure of the mind in acquiring the knowledge of cauſes. Since the *fact* of impulſe is not really *obſerved* in the celeſtial deflections, nor in the motions of heavy bodies, the law cannot be *inferred*. They ſay that it is not even neceſſary to ſhow that the phenomena of the celeſtial motions are unlike the phenomena of impulſe, although this can be done in the completeſt manner. It is enough that neither the fluid nor the impulſe are obſerved; and therefore they are in the right when they aſſert, that there is inherent in, or accompanies all the bodies of the ſyſtem, a power by which they deflect to one another. See OPTICS.

The debate is foreign to our preſent purpoſe, which is only to ſhow how the obſervation and arrangement of phenomena terminates in the diſcovery of their cauſes, or the diſcovery of the powers or properties of natural ſubſtances.

This is a taſk of great difficulty, as it is of great importance. There are two chief cauſes of this difficulty.

55 Cauſes of the difficulty of philoſophical inveſtigation.

1. In moſt of the ſpontaneous phenomena of nature there is a complication of many events, and ſome of them eſcape our obſervation. Attending only to the moſt obvious or remarkable, we conjoin theſe only in our imagination, and are apt to think theſe the concomitant events in nature, the proper indication of the cauſe, and the ſubjects of this philoſophical relation, and to ſuppoſe that they are always conjoined by nature. Thus it was thought that there reſided in a vibrating chord a power by which the ſenſation of ſound was excited, or that a chord had a ſounding quality. But it appears clearly from obſervation that there is an inconceivable number of events interpoſed between the vibration of the chord and the ſenſitive affection of our ear; and therefore, that ſound is not the effect of the vibration of the chord, but of the very laſt event of this ſeries: and this is completely

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pletely demonstrated by showing that the vibration and the sound are *not necessarily* connected, because they are not *always* connected, but require the interposition of air or of some other elastic body.

These observations show the necessity of the most accurate and minute observation of the phenomena, that none of those intermediate events may escape us, and we be thus exposed to the chance of imaginary connections between events which are really far asunder in the procedure of nature. As the study has improved, mistakes of this kind have been corrected; and philosophers are careful to make their trains of events under one name as short as possible. Thus, in medicine, a drug is no longer considered as a *specific* remedy for the disease which is sometimes cured when it has been used, but is denominated by its most immediate operation on the animal frame: it is no longer called a *febrifuge*, but a *sudorific*.

56 Means of insuring success.

2. When many natural powers combine their influence in a spontaneous phenomenon of nature, it is frequently very difficult to discover what part of the complicated effect is the effect of each; and to state those circumstances of similarity which are the foundation of a physical law, or intitle us to infer the agency of any natural power. The most likely method for insuring success in such cases is to get rid of this complication of event, by putting the subject into such a situation that the operation of all the known powers of nature shall be suspended, or so modified as we may perfectly understand *their* effects. We can thus appreciate the effects of such as we could neither modify nor suspend, or we can discover the existence of a new law, the operation of a new power.

This is called *making an experiment*; and is, of all, the most effectual way of advancing in the knowledge of nature, and has been called EXPERIMENTAL PHILOSOPHY.

57 A seeming anomaly explained.

It seems, however, at first sight, in direct opposition to the procedure of nature in forming general laws. These are formed by induction from multitudes of individual facts, and must be affirmed to no greater extent than the induction on which they are founded. Yet it is a matter of fact, a physical law of human thought, that one simple, clear, and unequivocal experiment, gives us the most complete confidence in the truth of a general conclusion from it to every similar case. Whence this anomaly? It is not an anomaly or contradiction of the general maxim of philosophical investigation, but the most refined application of it. There is no law more general than this, that "Nature is constant in all her operations." The judicious and simple form of our experiment insures us (we imagine) in the complete knowledge of all the circumstances of the event. Upon this supposition, and this alone, we consider the experiment as the faithful representative of every possible case of the conjunction. This will be more minutely considered afterwards.

58 Theory or explanation of subordinate phenomena.

The last branch of philosophic occupation is the explanation of subordinate phenomena. This is nothing more than the referring any particular phenomenon to that class in which it is included; or, in the language of philosophy, it is the pointing out the general law, or that general fact of which the phenomenon is a particular instance. Thus the feeling of the obligations of virtue is thought to be explained, when it is shown to be a particular case of that regard which every person has for his dearest interests. The rise of water in pumps is explained, when we show it to be a particular case of the pressure of fluids, or of the air. The general law under which we show it to be properly arranged is called the PRINCIPLE of the explanation, and the explanation itself is called the THEORY of the phenomenon. Thus Euler's explanation of the lunar irregularities is called a theory of the lunar motions on the principle of gravitation.

This may be done either in order to advance our own knowledge of nature, or to communicate it to others. If done with the first view, we must examine the phenomenon minutely, and endeavour to detect every circumstance in it, and thus discover all the known laws of nature which concur in its production; we then appreciate the operation of each according to the circumstances of its exertion; we then combine all these, and compare the result with the phenomenon. If they are similar, we have explained the phenomenon. We cannot give a better example than Franklin's explanation of the phenomena of thunder and lightning. See LIGHTNING, and ELECTRICITY *Index*.

If we explain a phenomenon from known principles, we proceed synthetically from the general law already established and *known* to exert its influence in the present instance. We state this influence both in kind and degree according to the circumstances of the case; and having combined them, we compare the result with the phenomenon, and show their agreement, and thus it is explained. Thus, because all the bodies of the solar system mutually gravitate, the moon gravitates to the sun as well as to the earth, and is continually, and in a certain determinate manner, deflected from that part which she would describe did she gravitate only to the earth. Her motion round the earth will be retarded during the first and third quarters of her orbit, and accelerated during the second and fourth. Her orbit and her period will be increased during our winter, and diminished during our summer. Her apogee will advance, and her nodes will recede; and the inclination of her orbit will be greatest when the nodes are in syzigee, and least when they are in quadrature. And all these variations will be in certain precise degrees. Then we show that all these things actually obtain in the lunar motions, and they are considered as explained.

This summary account of the object and employment in all philosophical discussion is sufficient for pointing out its place in the circle of the sciences, and will serve to direct us to the proper methods of prosecuting it with success. Events are its object; and they are considered as connected with each other by causation, which may therefore be called the philosophical relation of things. The following may be adopted as the fundamental proposition on which all philosophical discussion proceeds, and under which every philosophical discussion or discovery may be arranged:

"*Every change that we observe in the state or condition of things* IS CONSIDERED BY US *as an effect, indicating the agency, characterising the kind, and determining the degree of its* INFERRED *cause*." 59 Fundamental proposition of philosophical discussion.

As thus enounced, this proposition is evidently a physical law of human thought. It may be enounced as a necessary and independent truth, by saying, *every change in the state and condition of things* IS AN EFFECT, &c. And

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And accordingly it has been ſo enounced by Dr Reid*; and its title to this denomination has been abundantly ſupported by him. But we have no occaſion to conſider it as poſſeſſing this quality. We are ſpeaking of philoſophy, which is ſomething contingent, depending on the exiſtence and conſtitution of an intellectual being ſuch as man; and, in conformity to the view which we have endeavoured to give of human knowledge in the ſubjects of philoſophical relation, it is quite ſufficient for our purpoſe that we maintain its title to the rank of an univerſal law of human thought. This will make it a firſt principle, even although it may not be a neceſſary truth.

* *Eſſays on the intellectual Powers of Man.*

All the proof neceſſary for this purpoſe is univerſality of fact; and we believe this to be without exception. We are not to expect that all mankind have made, or will ever make, a formal declaration of their opinion; but we may venture to ſay that all have made it, and continually do make it, virtually. What have the philoſophers of all ages been employed about but the diſcovery of the cauſes of thoſe changes that are inceſſantly going on? *Nil turpius phyſico* (ſays Cicero) *quam fieri ſine cauſâ quidquam dicere.* Human curioſity has been directed to nothing ſo powerfully and ſo conſtantly as to this. Many abſurd cauſes have been aſſigned for the phenomena of the univerſe; but no ſet of men have ever ſaid that they happened without a cauſe. This is ſo repugnant to all our propenſities and inſtincts, that even the atheiſtical ſect, who, of all others, would have profited moſt by the doctrine, have never thought of advancing it. To avoid ſo ſhocking an abſurdity, they have rather allowed that chance, that the concourſe of atoms, are the cauſes of the beautiful arrangements of nature. The thoughtleſs vulgar are no leſs ſolicitous than the philoſophers to diſcover the cauſe of things; and the poet expreſſes the natural and inſtinctive paſſion of all men, when he ſays,

Felix qui potuit rerum cognoſcere cauſas.

And this anxiety is not to nouriſh, but to get rid of ſuperſtitious fears: for thus

—— *metus omnes, et inexorabile fatum*
Subjecit pedibus, ſtrepitumque Acherontis avari.

Had men never ſpeculated, their conduct alone gives ſufficient evidence of the univerſality of the opinion. The whole conduct of man is regulated by it, nay, almoſt wholly proceeds upon it, in the moſt important matters, and where experience ſeems to leave us in doubt: and to act otherwiſe, as if any thing whatever happened without a cauſe, would be a declaration of inſanity. Dr Reid has beautifully illuſtrated this truth, by obſerving, that even a child will laugh at you if you try to perſuade him that the top, which he miſſes from the place where he left it, was taken away by nobody. You may perſuade him that it was taken away by a fairy or a ſpirit; but he believes no more about this nobody, than the maſter of the houſe when *he* is told that nobody was the author of any piece of theft or miſchief. What opinion would be formed, ſays Dr Reid, of the intellects of the juryman, on a trial for murder by perſons unknown, who ſhould ſay that the fractured ſkull, the watch and money gone, and other like circumſtances, might poſſibly have no cauſe? he would be pronounced inſane or corrupted.

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We believe that Mr Hume is the firſt author who has ventured to call the truth of this opinion in queſtion; and even *he* does it only in the way of mere poſſibility. He acknowledges the *generality* of the opinion; and he only objects to the foundation of this generality: and he objects to it merely becauſe it does not quadrate with his theory of belief; and therefore it *may* happen that ſome men may have no ſuch opinion. But it muſt be obſerved on this occaſion, that the opinion of a philoſopher is of no greater weight in a caſe like this than that of a ploughboy. If it be a firſt principle, directing the opinions and actions of all, it muſt operate on the minds of all. The philoſopher is the only perſon who may chance to be without it: for it requires much labour, and long habits reſolutely maintained, to warp our natural ſentiments; and experience ſhows us that they may be warped if we are at ſufficient pains. It is alſo worthy of remark, that this philoſopher ſeems as much under the influence of this law as ordinary mortals. It is only when he is aware of its not tallying with his other doctrines that his ſcruples appear. Obſerve how he ſpeaks when off his guard: "As to thoſe impreſſions which ariſe from the ſenſes, their ultimate cauſe is, in my opinion, perfectly inexplicable by human reaſon; and it will always be impoſſible to decide with certainty whether they ariſe immediately from the object, are produced by the creative power of the mind, or are derived from the Author of our being."

60 Controverted by Mr Hume

61 with great inconſiſtency.

Among theſe alternatives he never thought of their not being derived from any cauſe.

But it is not enough to ſhow that this is a phyſical law of the human mind: we have aſſumed it as a firſt principle, the foundation of a whole ſcience; therefore not included in or derived from any thing more general. Mr Hume's endeavours to prove that it is not a neceſſary truth, ſhow with ſufficient evidence that moſt attempts to derive it in the way of argument are *petitiones principii*; a thing very commonly met with in all attempts to prove firſt principles. It cannot be proved by induction of facts that every event has a cauſe, becauſe induction always ſuppoſes an *obſerved fact* or event. Now in by far the greateſt number of events the cauſes are unknown. Perhaps in no event whatever do we know the real cauſe, or that power or energy which, without any intervention, produces the effect. No man can ſay, that in the ſimpleſt event which he ever obſerved, he was fully appriſed of every circumſtance which concurred to its production. We ſuppoſe that no event in nature can be adduced more ſimple than the motion of a ſuſpended glaſs ball when gently ſtruck by another glaſs ball; and we imagine that moſt of our readers will ſay that he perfectly ſees every thing which happens in this phenomenon. We believe, too, that moſt of our readers are of opinion that a body is never put in motion but by the impulſe of another, except in the caſes of animal motion; and that they are diſpoſed to imagine that magnets put iron in motion, and that an electrified body moves another by means of an interpoſed though inviſible fluid ſomehow circulating round them. Now we muſt inform ſuch readers, that unleſs the ſtroke has been very ſmart, ſo ſmart indeed as to ſhatter the glaſs balls, the motion of the ſuſpended ball was produced without impulſe: that is, the two balls were not in contact during the ſtroke; and the diſtance between them was not leſs than the

62 This propoſition a firſt principle incapable of proof.

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9000th part of an inch, and probably much greater. We muſt ſay farther, that it is not certain that even the moſt violent ſtroke, ſuch as would ſhatter them to pieces, is enough to bring them into real contact. The proofs of this ſingular poſition are too long for this place; but the evidence will be ſufficiently ſeen by conſulting the article Optics.

Unleſs, therefore, our readers are willing to allow that the ſuſpended ball was put in motion by a repulſive force inherent in one or both balls, they muſt acknowledge that they *do not* fully know all the circumſtances of this ſo ſimple phenomenon, or all the train of events which happen in it; and therefore they are reduced to the neceſſity of *ſuppoſing*, although they do not ſee it, an intervening fluid or matter, by the immediate action of whoſe *adjoining* particles the motion is produced.

This being the caſe in the ſimpleſt phenomenon that we can pitch upon, what ſhall we ſay of the numberleſs multitudes which are incomparably more complex: Muſt we not acknowledge that the efficient cauſes, even in the vulgar ſenſe of the word, the immediately preceding events, are unknown, becauſe the conjunctions are not obſerved? and therefore it cannot be ſaid that it is from experimental induction that this truth gains univerſal belief. Experience, ſo far from ſupporting it as a direct proof, ſeems rather the ſtrongeſt argument againſt it; for we have no experiment of unqueſtionable authority but the narrow circle of our own power exerted on our thoughts and actions. And even here there are perhaps caſes of change where we cannot ſay with certainty that we perceive the efficient cauſe.

Nothing ſeems to remain, therefore, but to allow that this phyſical law of human judgment is inſtinctive, a conſtituent of the human ſoul, a firſt principle; and incapable of any other proof than the appeal to the feelings of every man.

63
Cauſes not obſerved but inferred from the phenomena which are the language of nature.

Simply to ſay, that every change is conſidered as an effect, is not giving the whole characters of this phyſical law. The cauſe is not always, perhaps never, *obſerved*, but is *inferred* from the phenomena. The inference is therefore in every inſtance dependant on the phenomenon. The phenomenon is to us the language of nature: It is therefore the ſole indication of the cauſe and of its agency: it is therefore the indication of the very cauſe, and of no other. The obſerved change therefore characteriſes the cauſe, and marks its kind. This is confirmed by every word of philoſophical language, where, as has already been obſerved, the names of the inferred powers of nature are nothing but either abbreviated deſcriptions of the phenomena, or terms which are defined ſolely by ſuch deſcriptions. In like manner, the phenomenon determines the cauſe in a *particular degree*, and in no other; and we have no immediate meaſure of the degree of the cauſe but the phenomenon itſelf. We take many meaſures of the cauſe, it is true; but on examination they will be found not to be immediate meaſures of the cauſe, but of the effect. Aſſuming gravitation as the cauſe of the planetary deviations from uniform rectilineal motion, we ſay that the gravitation of the moon is but $\frac{1}{3600}$th part of the gravitation of a ſtone thrown from the hand: but we ſay this only from obſerving that the deflection of the ſtone is 3600 times greater than the ſimultaneous deflection of the moon. In ſhort, our whole knowledge of the cauſe is not only *founded* on our knowledge of the phenomenon, but *it is the ſame*. This will be found a remark of immenſe conſequence in the proſecution of philoſophical reſearches; and a ſtrict attention to it will not only guard us againſt a thouſand miſtakes into which the reaſoning pride of man would continually lead us, but will alſo enable us fully to detect many egregious and fatal blunders made in conſequence of this philoſophical vanity. Nothing can be more evident than that whenever we are puzzled, it would be folly to continue groping among thoſe obſcure beings called *cauſes*, when we have their prototypes, the phenomena themſelves, in our hands.

Such is the account which may be given of philoſophy, the ſtudy of the works of God, as related by cauſation. It is of vaſt extent, reaching from an atom to the glorious Author of the Univerſe, and contemplating the whole connected chain of intelligent, ſenſitive, and inanimate beings. The philoſopher makes uſe of the deſcriptions and arrangements of the natural hiſtorian as of mighty uſe to himſelf in the beginning of his career, confiding in the uniformity of nature, and expecting that ſimilarity in the quieſcent properties of things will be accompanied by ſome reſemblances in thoſe more important properties which conſtitute their mutual dependencies, linking them together in a great and endleſsly ramified chain of events.

We have endeavoured to aſcertain with preciſion the peculiar province of philoſophy, both by means of its object and its mode of procedure. After this it will not require many words to point out the methods for proſecuting the ſtudy with expedition and with ſucceſs. The rules of philoſophizing, which Newton premiſes to his account of the planetary motions, which he ſo ſcrupulouſly followed, and with a ſucceſs which gives them great authority, are all in ſtrict conformity to the view we have now given of the ſubject.

64
The chief rule of philoſophiſing explained.

The chief rule is, that ſimilar cauſes are to be aſſigned to ſimilar phenomena. This is indeed the ſource of all our knowledge of connected nature; and without it the univerſe would only preſent to us an incomprehenſible chaos. It is by no means, however, neceſſary to enjoin this as a maxim for our procedure: it is an inſtinctive propenſity of the human mind. It is abſolutely neceſſary, on the contrary, to caution us in the application of this propenſity. We muſt be extremely confident in the certainty of the reſemblance before we venture to make any inference. We are prone to reaſon from analogy: the very employment is agreeable; and we are ever diſpoſed to embrace opportunities of engaging in it. For this reaſon we are ſatisfied with very ſlight reſemblances, and eagerly run over the conſequences, as if the reſemblance were complete; and our reſearches frequently terminate in falſehood.

This propenſity to analogical reaſoning is aided by another equally ſtrong, and equally uſeful, when properly directed; we mean the propenſity to form general laws: it is in fact a propenſity to diſcover *cauſes*, which is equivalent to the eſtabliſhing of general laws. It appears in another form, and is called a love of or taſte for ſimplicity; and this is encouraged or juſtified as agreeable to the uniformity and ſimplicity of nature. "Natura ſemper ſibi ſimilis et conſona," ſays Newton; "Fruſtra fit per plura, quod fieri poteſt per pauciora," ſays another. The beautiful, the wiſe economy of nature, are phraſes in every body's mouth; and Newton enjoins us to adopt no more cauſes than are ſufficient to explain

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explain the phenomena. All this is very well, and is true in its own degree; but it is too frequently the ſubterfuge of human vanity and ſelf-love. This inordinate admiration of the economy and ſimplicity of nature is generally conjoined with a manifeſt love of ſyſtem, and with the actual production of ſome new ſyſtem, where from one general principle ſome extenſive theory or explanation is deduced and offered to the world. The author ſees *a ſort* of reſemblance between a certain ſeries of phenomena and the conſequences of ſome principle, and thinks the principle adequate to their explanation. Then, on the authority of the acknowledged ſimplicity of nature, he roundly excludes all other principles of explanation; becauſe, ſays he, this principle is ſufficient "et fruſtra fit per plura," &c. We could point out many inſtances of this kind in the writings of perhaps the firſt mathematician and the pooreſt philoſopher of this century; where extenſive theories are thus cavalierly exhibited, which a few years examination have ſhown to be nothing but analogies, indiſtinctly obſerved, and, what is worſe, inaccurately applied.

65 A true cauſe explained.

To regulate theſe hazardous propenſities, and keep philoſophers in the right path, Newton inculcates another rule, or rather gives a modification of this injunction of ſimplicity. He enjoins that no cauſe ſhall be admitted but what is real. His words are, that *no cauſes ſhall be admitted but ſuch as are true, and ſufficient to account for the phenomena.* We apprehend that the meaning of this rule has been miſtaken by many philoſophers, who imagine that by *true* he means cauſes which really exiſt in nature, and are not mere creatures of the imagination. We have met with ſome who would boggle at the doctrines of Ariſtotle reſpecting the planetary motions, viz. that they are carried along by conducting intelligent minds, becauſe we know of *none ſuch* in the univerſe; and who would nevertheleſs think the doctrine of the Carteſian vortices deſerving of at leaſt an examination, becauſe we ſee ſuch vortices exiſt, and produce effects which have ſome reſemblance to the planetary motions, and have juſtly rejected them, *ſolely* becauſe this reſemblance has been very imperfect. We apprehend Newton's meaning by theſe words is, that no cauſe of any event ſhall be admitted, or even conſidered, which we *do not know* to be actually concurring or exerting ſome influence *in that very event.* If this be his meaning, he would reject the Carteſian vortices, and the conducting ſpirits of Ariſtotle, for one and the ſame reaſon; not becauſe they were not adequate to the explanation, nor becauſe ſuch cauſes do not exiſt in nature, but becauſe we did not *ſee them* anyhow concerned in the phenomenon under conſideration. We neither ſee a ſpirit nor a vortex, and therefore need not trouble ourſelves with enquiring what effects they would produce. Now we know that this was his very conduct, and what has diſtinguiſhed him from all philoſophers who preceded him, though many, by following his example, have alſo been rewarded by ſimilar ſucceſs. This has procured to Newton the character of the *modeſt* philoſopher; and modeſt his procedure may, for diſtinction's ſake, be called, becauſe the contrary procedure of others did not originate ſo much from ignorance as from vanity. Newton's conductor in this was not modeſty, but ſagacity, prudence, caution, and to ſay it purely, it was ſound judgment.

For the bonds of nature, the ſuppoſed philoſophical cauſes are not *obſerved;* they are *inferred* from the phenomena. When two ſubſtances are obſerved, and only when they are obſerved, to be connected in any ſeries of events, we *infer* that they are connected by a natural power: but when one of the ſubſtances is not ſeen, but fancied, no law of human thought produces any inference whatever. For this reaſon alone Newton ſtopped ſhort at the laſt FACT which he could diſcover in the ſolar ſyſtem, that all bodies were deflected to all other bodies, according to certain regulations of diſtance and quantity of matter. When told that he had done nothing in philoſophy, that he had diſcovered no cauſe, and that to merit any praiſe he muſt ſhow how this deflection was produced;—he ſaid that he knew no more than he had told them; that he ſaw nothing cauſing this deflection; and was contented with having diſcovered it ſo exactly, that a good mathematician could now make tables of the planetary motions as accurate as he pleaſed, and with hoping in a few years to have every purpoſe of navigation and of philoſophical curioſity completely anſwered; and he was not diſappointed. And when philoſophers on all ſides were contriving hypothetical fluids and vortices which would produce theſe deflections, he contented himſelf with ſhowing the total inconſiſtency of theſe explanations with the mechanical principles acknowledged by their authors; ſhowing that they had tranſgreſſed both parts of his rule, their cauſes neither being real nor ſufficient for explaining the phenomena. A cauſe is ſufficient for explaining a phenomenon only when its legitimate conſequences are perfectly agreeable to theſe phenomena.

Newton's diſcoveries remain without any diminution or change: no philoſopher has yet advanced a ſtep further.

But let not the authority, or even the ſucceſs, of Newton be our guide. Is his rule founded in reaſon? It ſurely is. For if philoſophy be the only interpretation of nature's language, the inference of cauſes from the phenomena, a fancied or hypothetical phenomenon can produce nothing but a fanciful cauſe, and can make no addition to our knowledge of real nature. 66 This doctrine founded in reaſon.

All hypotheſes therefore muſt be baniſhed from philoſophical diſcuſſion as frivolous and uſeleſs, adminiſtering to vanity alone. As the explanation of any appearance is nothing but the pointing out the general fact, of which this is a particular inſtance, a hypotheſis can give no explanation: knowing nothing of cauſe and effect but the conjunction of two events, we ſee nothing of cauſation where one of the events is hypothetical. Although all the legitimate conſequences of a hypothetical principle ſhould be perfectly ſimilar to the phenomenon, it is extremely dangerous to aſſume this principle as the real cauſe. It is illogical to make uſe of the economy of nature as an argument for the truth of any hypotheſis: for if true, it is a phyſical truth, a matter of fact, and true only to the extent in which it is obſerved, and we are not entitled to ſay that it is ſo one ſtep farther; therefore not in *this* caſe *till it be obſerved.* But the propoſition that nature is ſo economical is falſe; and it is aſtoniſhing that it has been ſo lazily acquieſced in by the *readers* of hypotheſes: for it is not the *authors* who are deceived by it, they are generally led by their own vanity. Nothing is more obſervable than the prodigious variety of nature. That the ſame phenomena may be produced by different means is well known to the aſtronomers, 67 Danger of hypotheſes.

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nomers, who must all grant, that the appearances of motion will be precisely the same whether the earth moves round the sun like the other planets, or whether the sun with his attendant planets moves round the earth; and that the demonstration of the first opinion is had from a fact totally unconnected with all the deflections or even with their causes: for it may be asserted, that Dr Bradley's discovery of the aberration of the fixed stars, in consequence of the progressive motion of light, was the first thing which put the Copernican system beyond question; and even this is still capable of being explained in another way. The Author of Nature seems to delight in variety; and there cannot be named a single purpose on which the most inconceivable fertility in resource is not observed. It is the most delightful occupation of the curious mind and the sensible heart to contemplate the various contrivances of nature in accomplishing similar ends.

As a principle therefore on which to found any maxim of philosophical procedure, this is not only injudicious, because imprudent and *apt* to mislead, but as false, and almost sure to mislead. In conformity to this observation, it must be added, that nothing has done so much harm in philosophy as the introduction of hypotheses.

Authors have commonly been satisfied with very slight resemblances, and readers are easily misled by the appearances of reasoning which these resemblances have countenanced. The ancients, and above all Aristotle, were much given to this mode of explanation, and have filled philosophy with absurdities. The slightest resemblances were with them sufficient foundations of theories. It has been by very slow degrees that men have learned caution in this respect; and we are sorry to say that we are not yet cured of the disease of hypothetical systematizing, and to see attempts made by ingenious men to bring the frivolous theories of antiquity again into credit. Nay, modern philosophers even of the greatest name are by no means exempted from the reproach of hypothetical theories. Their writings abound in ethers, nervous fluids, animal spirits, vortices, vibrations, and other invisible agents. We may affirm that all these attempts may be shown to be either unintelligible, fruitless, or false. Either the hypothesis has been such that no consequence can be distinctly drawn from it, on account of its obscurity and total want of resemblance to any thing we know; or the just and legitimate consequences of the hypothesis are inconsistent with the phenomena (N). This is remarkably the case in the hypotheses which have been introduced for the explanation of the mechanical phenomena of the universe. These can be examined by accurate science, and the consequences compared without any mistake; and nothing else but a perfect agreement should induce us even to listen to any hypothesis whatever.

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It may here be asked, Whether, in the case of the most perfect agreement, after the most extensive comparison, the hypothesis should be admitted? We believe that this must be left to the feelings of the mind. When the belief is irresistible, we can reason no more. But as there is no impossibility of as perfect an agreement with some other hypothesis, it is evident that it does not convey an irrefragable title to our hypothesis. It is said, that such an agreement authorises the reception of the hypothetical theory in the same manner as we *must* admit that to be the *true* cypher of a letter which will make perfect sense of it. But this is not true: in decyphering a letter we know the sounds which *must* be represented by the characters, and that they are really the constituents of speech: but in hypothetical explanations the first principle is not known to exist; nay, it is possible to make two cyphers, each of which shall give a meaning to the letter. Instances of this are to be seen in treatises on the art of decyphering; and there has been lately discovered a national character (the *ogam* discovered in Ireland) which has this property.

We conclude our criticism on hypothetical explanations with this observation, that it is *impossible* that they can give any addition of knowledge. In every hypothesis we thrust in an intermediate event between the phenomenon and some general law; and this event is not seen, but supposed. Therefore, according to the true maxims of philosophical investigation, we give no explanation; for we are not by this means enabled to assign the general law in which this particular phenomenon is included: nay, the hypothesis makes no addition to our list of general laws; for our hypotheses must be *selected*, in order to tally with all the phenomena. The hypothesis therefore is understood only *by* and *in* the phenomena; and it must not be made more general than the phenomena themselves. The hypothesis gives no generalisation of facts. Its very application is founded on a great coincidence of facts; and the hypothetical fact is thrust in between two which we really observe to be united by nature. The applicability therefore of the hypothesis

(N) It has often been matter of amusement to us to examine the hypothetical theories of ingenious men, and to observe the power of nature even when we are transgressing her commands, *Naturam expellas furca, tamen usque revertitur*. The hypothesis of an ingenious man is framed in perfect conformity to nature's dictates: for you will find that the hypothetical cause is touched and retouched, like the first sitting of a picture, till it is made to resemble the phenomena, and the cause is still inferred, nay explained, in spite of all his ingenuity, from the phenomenon; and then, instead of desiring the spectators to pay him his due praise, by saying that the picture is like the man, he insists that they shall say, what gives him no credit, that the man is like the picture. But alas! this is seldom the case: The picture is generally an anamorphosis, unlike any thing extant in nature, and having parts totally incongruous. We have seen such pictures, where a wood is standing on the sea, and an eye is on the end of an elephant's trunk; and yet when this was viewed through a proper glass, the wood became an eyebrow to the eye, and the proboscis was a very pretty ringlet of hair. We beg indulgence for this piece of levity, because it is a most apposite illustration of a hypothetical theory. The resemblance between the principle and phenomenon is true only in detached unconnected scraps, and the principle itself is an incongruous patchwork. But by a perversion of the rules of logic, all these inconsistencies are put out of view, and the explanation is something like the phenomenon.

hypotheſis is not more extenſive than the ſimilarity of facts which we obſerve, and the hypothetical law is not more general than the obſerved law. Let us then throw away entirely the hypothetical law, and inſert the obſerved one in our liſt of general laws: it will be in different language from the hypothetical law, but it will expreſs the ſame facts in nature.

68 On what occaſions they may be uſeful.

It is in experimental philoſophy alone that hypotheſes can have any juſt claim to admiſſion; and here they are not admitted as explanations, but as conjectures ſerving to direct our line of experiments.

Effects only appear; and by their appearance, and the previous information of experience, cauſes are immediately aſcertained by the perfect ſimilarity of the whole train of events to other trains formerly obſerved: Or they are ſuggeſted by more imperfect reſemblances of the phenomena; and theſe ſuggeſtions are made with ſtronger or fainter evidence, according as the reſemblance is more or leſs perfect. Theſe ſuggeſtions do not amount to a confidential inference, and only raiſe a conjecture. Wiſhing to verify or overturn this conjecture, we have recourſe to experiment; and we put the ſubject under conſideration in ſuch a ſituation, that we can ſay what will be the effect of the conjectural cauſe if real. If this tallies with the appearance, our conjecture has more probability of truth, and we vary the ſituation, which will produce a new ſet of effects of the conjectured cauſe, and ſo on. It is evident that the probability of our conjecture will increaſe with the increaſe of the conformity of the legitimate effects of the ſuppoſed cauſe with the phenomena, and that it will be entirely deſtroyed by *one* diſagreement. In this way conjectures have their great uſe, and are the ordinary means by which experimental philoſophy is improved. But conjectural ſyſtems are worſe than nonſenſe, filling the mind with falſe notions of nature, and generally leading us into a courſe of improper conduct when they become principles of action. This is acknowledged even by the abettors of hypothetical ſyſtems themſelves, when employed in overturning thoſe of their predeceſſors, and eſtabliſhing their own: witneſs the ſucceſſive maintainers of the many hypothetical ſyſtems in medicine, which have had their ſhort-lived courſe within theſe two laſt centuries.

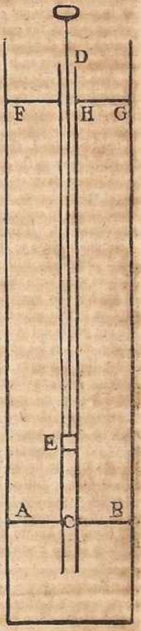
Let every perſon therefore who calls himſelf a philoſopher reſolutely determine to reject all temptations to this kind of ſyſtem-making, and let him never conſider any compoſition of this kind as any thing better than the amuſement of an idle hour.

69 True mode of philoſophical procedure.

After theſe obſervations, it cannot require much diſcuſſion to mark the mode of procedure which will inſure progreſs in all philoſophical inveſtigations.

The ſphere of our intuitive knowledge is very limited; and we muſt be indebted for the greateſt part of our intellectual attainments to our rational powers, and it muſt be deductive. In the ſpontaneous phenomena of nature, whether of mind or body, it ſeldom happens that the energy of that natural power, which is the principle of explanation, is ſo immediately connected with the phenomenon that we ſee the connection at once. Its exertions are frequently concealed, and in all caſes modified, by the joint exertions of other natural powers: the particular exertion of each muſt be conſidered apart, and their mutual connection traced out. It is only in this way that we can diſcover the perhaps long train of intermediate operations, and alſo ſee in what manner and degree the real principle of explanation concurs in the oſtenſible proceſs of nature.

In all ſuch caſes it is evident that our inveſtigation (and inveſtigation it moſt ſtrictly is) muſt proceed by ſteps, conducted by the ſure hand of logical method. To take an inſtance from the material world, let us liſten to Galileo while he is teaching his friends the cauſe of the riſe of water in a pump. He ſays that it is owing to the preſſure of the air. This is his principle; and he announces it in all its extent. All matter, ſays he, is heavy, and in particular air is heavy. He then points out the connection of this general principle with the phenomenon. Air being heavy, it muſt be ſupported; it muſt lie and preſs on what ſupports it; it muſt preſs on the ſurface AB of the water in the ciſtern ſurrounding the pipe CD of the pump; and alſo on the water C within this pipe. He then takes notice of another general principle which exerts its ſubordinate influence in this proceſs. Water is a fluid; a fluid is a body whoſe parts yield to the ſmalleſt impreſſion; and, by yielding, are eaſily moved among themſelves; and no little parcel of the fluid can remain at reſt unleſs it be equally preſſed in every direction, but will recede from that ſide where it ſuſtains the greateſt preſſure. In conſequence of this fluidity, *known* to be a property of water, if any part of it is preſſed, the preſſure is propagated through the whole; and if not reſiſted on every ſide, the water will move to that ſide where the propagated preſſure is not reſiſted. All theſe ſubordinate or collateral propoſitions are ſuppoſed to be previouſly demonſtrated or allowed. Water therefore muſt yield to the preſſure of the air unleſs preſſed by it on every ſide, and muſt move to that ſide where it is not withheld by ſome oppoſite preſſure. He then proceeds to ſhow, from the ſtructure of the pump, that there is no oppoſing preſſure on the water in the inſide of the pump. "For (ſays he) ſuppoſe the piſton thruſt down till it touches the ſurface of the water in the pipe; ſuppoſe the piſton now drawn up by a power ſufficient to lift it, and all the air incumbent on it; and ſuppoſe it drawn up a foot or a fathom—there remains nothing now (ſays he) that I know of, to preſs on the ſurface of the water. In ſhort (ſays he), gentlemen, it appears to me, that the water in the pump is in the ſame ſituation that it would be in were there no air at all, but water poured into the ciſtern to a height AF: ſuch, that the column of water FABG preſſes on the ſurface AB as much as the air does. Now in this caſe we know that the water at C is preſſed upwards



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wards with a force equal to the weight of a column of water, having the fection of the pipe for its bafe and CH for its height. The water below C therefore will be preffed up into the pipe CD, and will rife to G, fo that it is on a level with the external water FG; that is, it will rife to H. This is a neceffary confequence of the weight and preffure of the incumbent column FABG, and the fluidity of the water in the ciftern. Confequences perfectly fimilar muft neceffarily follow from the weight and preffure of the air; and therefore on drawing up the pifton from the furface C of the water, with which it was in contact, the water muft follow it till it attain that height which will make its own weight a balance for the preffure of the circumambient air. Accordingly, gentlemen, the Italian plumbers inform me, that a pump will not raife water quite fifty palms; and from their information I conclude, that a pillar of water fifty palms high is fomewhat heavier than a pillar of air of the fame bafe, and reaching to the top of the atmofphere."

70 The fynthetic method.

Thus is the phenomenon explained. The rife of the water in the pump is fhown to be a particular cafe of the general fact in hydroftatics, that fluids in communicating veffels will ftand at heights which are inverfely as their denfities, or that columns of equal weights are in equilibrio.

This way of proceeding is called arguing *à priori*, the fynthetic method. It is founded on juft principles; and the great progrefs which we have made in the mathematical fciences by this mode of reafoning fhows to what length it may be carried with irrefiftible evidence. It has long been confidered as the only inlet to true knowledge; and nothing was allowed to be known with certainty which could not be demonftrated in this way to be true. Accordingly logic, or the art of reafoning, which was alfo called the art of difcovering truth, was nothing but a fet of rules for fuccefsfully conducting this mode of argument.

Under the direction of this infallible guide, it is not furely unreafonable to expect that philofophy has made fure progrefs towards perfection; and as we know that the brighteft geniufes of Athens and of Rome were for ages folely occupied in philofophical refearches in every path of human knowledge, it is equally reafonable to fuppofe that the progrefs has not only been fure but great. We have feen that the explanation of an appearance in nature is nothing but the arrangement of it into that general clafs in which it is comprehended. The clafs has its diftinguifhing mark, which, when it is found in the phenomenon under confideration, fixes it in its clafs, there to remain for ever an addition to our ftock of knowledge. Nothing can be loft any other way but by forgetting it; and the doctrines of philofophers muft be ftable like the laws of nature.

We have feen, however, that the very reverfe of all this is the cafe; that philofophy has but very lately emerged from worfe than total darknefs and ignorance; that what paffed under the name of philofophy was nothing but fyftems of errors (if fyftems they could be called), which were termed doctrines, delivered with the moft impofing apparatus of logical demonftration, but belied in almoft every inftance by experience, and affording us no affiftance in the application of the powers of nature to the purpofes of life. Nor will this excite much wonder in the mind of the enlightened reader of the prefent day, who reflects on the ufe that in this dialectic procefs was made of the *categories*, and the method in which thofe categories were formed. From firft principles fo vague in themfelves, and fo gratuitoufly affumed, ingenious men might deduce many different conclufions all equally erroneous: and that this was actually done, no furer evidence can be given, than that hardly a lifetime elapfed in which the whole fyftem of doctrines which had captivated the minds of the moft penetrating, have been oftener than once exploded and overturned by another fyftem, which flourifhed for a while, and then was fupplanted by a third which fhared the fame fate. Here was an infallible proof of their error, for inftability is incompatible with truth.

It is allowed by all that this has been the cafe in thofe branches of ftudy at leaft which contemplate the philofophical relations of the material world, in aftronomy, in mechanical philofophy, in chemiftry, in phyfiology, in medicine, in agriculture. It is alfo acknowledged, that in the courfe of lefs than two centuries back we have acquired much knowledge on thefe very fubjects, call it philofophy, or by what name you will, fo much more conformable to the natural courfe of things, that the deductions made from it by the fame rules of the fynthetic method are more conformable to fact, and therefore better fitted to direct our conduct and improve our powers. It is alfo certain that thefe bodies of doctrine which go by the name of philofophical fyftems, have much more ftability than in ancient times; and though fometimes in part fuperfeded, are feldom or never wholly exploded.

This cannot perhaps be affirmed with equal confidence with refpect to thefe fpeculations which have our intellect or propenfities for their object: and we have not perhaps attained fuch a reprefentation of human nature as will bear comparifon with the original; nor will the legitimate deductions from fuch doctrines be of much more fervice to us for directing our conduct than thofe of ancient times: and while we obferve this difference between thefe two general claffes of fpeculations, we may remark, that it is conjoined with a difference in the manner of conducting the ftudy. We have proceeded in the old Ariftotelian method when inveftigating the nature of mind; but we fee the material philofophers running about, paffing much of their time away from books in the fhop of the artizan, or in the open fields engaged in obfervation, labouring with their hands, and bufy with experiments. But the fpeculatift on the intellect and the active powers of the human foul feems unwilling to be indebted to any thing but his own ingenuity, and his labours are confined to the clofet. In the firft clafs, we have met with fomething like fuccefs, and we have improved many arts: in the other, it is to be feared that we are not much wifer, or better, or happier, for all our philofophic attainments. 71 No inlet to truth.

Here, therefore, muft furely have been fome great, fome fatal miftake. There has indeed been a material defect in our mode of procedure, in the employment of this method of reafoning as an inlet to truth. The fact is, that philofophers have totally miftaken the road of difcovery, and have pretended to fet out in their inveftigation from the very point where this journey fhould have terminated.

The Ariftotelian logic, the fyllogiftic art, that art fo much boafted of as the only inlet to true knowledge, the

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the only means of diſcovery, is in direct oppoſition to the ordinary procedure of nature, by which we every day, and in every action of our lives, acquire know-
72 ledge and diſcover truth. It is not the art of diſcovering truth, it is the art of communicating knowledge, and of detecting error: it is nothing more than the application of this maxim, 'whatever is true of a whole claſs of objects, is true of each individual of that claſs.' This is not a juſt account of the art of diſcovering truth, nor is it a complete account of the art of reaſoning. Reaſoning is the producing belief; and whatever mode of argumentation invariably and irreſiſtibly produces belief, is reaſoning. The ancient logic ſuppoſes that all the firſt principles are already known, and that nothing is wanted but the application of them to particular facts. But were this true, the application of them, as we have already obſerved, can hardly be called a diſcovery; but it is not true; and the fact is, that the firſt principles are generally the chief objects of our reſearch, and that they have come into view only now and then as it were by accident, and never by the labour of the logician. He indeed can tell us whether we have been miſtaken; for if our general principle be true, it muſt influence *every* particular caſe. If, therefore, it be falſe in any one of theſe, it is not a true principle. And it is here that we diſcover the ſource of that fluctuation which is ſo much complained of in philoſophy. The authors of ſyſtems give a ſet of conſecutive propoſitions logically deduced from a firſt principle, which has been haſtily adopted, and has no foundation in nature. This does not hinder the amuſement of framing a ſyſtem from it, nor this ſyſtem from pleaſing by its ſymmetry; and it takes a run: but when ſome officious follower thinks of making ſome uſe of it, which requires the compariſon with experience and obſervation, they are found totally unlike, and the whole fabric muſt be abandoned as unſound: and thus the ſucceſſive ſyſtems were continually puſhing out their predeceſſors, and preſently met with the ſame treatment.

But the art of communicating knowledge.

How was this to be remedied? The ratiocination was ſeldom egregiouſly wrong; the ſyllogiſtic art had ere now attained a degree of perfection which left little room for improvement, and was ſo familiarly underſtood by the philoſophical practitioners, that they ſeldom committed any great blunders. Muſt we examine the firſt principles? This was a taſk quite new in ſcience; and there were hardly any rules in the received ſyſtems of logic to direct us to the ſucceſsful performance of it. Ariſtotle, the ſagacious inventor of thoſe rules, had not totally omitted it; but in the fervour of philoſophic ſpeculation he had made little uſe of them. His fertile genius never was at a loſs for firſt principles, which anſwered the purpoſe of verbal diſquiſition without much riſk of being belied on account of its diſſimilitude to nature; for there was frequently no prototype with which his ſyſtematic doctrine could be compared. His enthuſiaſtic followers found abundant amuſement in following his example; and philoſophy, no longer in the hands of men acquainted with the world, converſant in the great book of nature, was now confined almoſt entirely to recluſe monks, equally ignorant of men and of things. But curioſity was awakened, and the men of genius were fretted as well as diſguſted with the diſquiſitions of the ſchools, which one moment raiſed expectations by the ſymmetry of compoſition, and the next moment blaſted them by their inconſiſtency with experience.

They ſaw that the beſt way was to begin *de novo*, to throw away the firſt principles altogether, without exception or examination, and endeavour to find out new ones, which ſhould ſtand the teſt of logic; that is, ſhould in every caſe be agreeable to fact.

73 Philoſophers began to reflect, that under the unnoticed tuition of kind nature we have acquired much uſeful knowledge. It is therefore highly probable, that her method is the moſt proper for acquiring knowledge, and that by imitating her manner we ſhall have the like ſucceſs. We are too apt to ſlight the occupations of children, whom we may obſerve continually buſy turning every thing over and over, putting them into every ſituation, and at every diſtance. We excuſe it, ſaying that it is an innocent amuſement; but we ſhould ſay with an ingenious philoſopher (Dr Reid), that they are moſt ſeriouſly and rationally employed: they are acquiring the habits of obſervation; and by merely indulging an undetermined curioſity, they are making themſelves acquainted with ſurrounding objects: they are ſtruck by ſimilitudes, and amuſed with mere claſſification. If ſome new effect occurs from any of their little plays, they are eager to repeat it. When a child has for the firſt time tumbled a ſpoon from the table, and is pleaſed with its jingling noiſe on the floor, if another lie within its reach, it is ſure to ſhare the ſame fate. If the child be indulged in this diverſion, it will repeat it with greedineſs that deſerves our attention. The very firſt eager repetition ſhows a confidence in the conſtancy of natural operations, which we can hardly aſcribe wholly to experience; and its keenneſs to repeat the experiment, ſhows the intereſt which it takes in the exerciſe of this moſt uſeful propenſity. It is beginning the ſtudy of nature; and its occupation is the ſame with that of a Newton computing the motions of the moon by his ſublime theory, and comparing his calculus with obſervation. The child and the philoſopher are equally employed in the contemplation of a ſimilarity of event, and are anxious that this ſimilarity ſhall return. The child, it is true, thinks not of this abſtract object of contemplation, but throws down the ſpoon again to have the pleaſure of hearing it jingle. The philoſopher ſuſpects that the conjunction of events is the conſequence of a general law of nature, and tries an experiment where this conjunction recurs. The child is happy, and eager to enjoy a pleaſure which to us appears highly frivolous; but it has the ſame foundation with the pleaſure of the philoſopher, who rejoices in the ſucceſs of his experiment: and the fact, formerly a trifle to both, now acquires importance. Both go on repeating the experiment, till the fact ceaſes to be a novelty to either: the child is ſatisfied, and the philoſopher has now eſtabliſhed a new law of nature.

The method of induction pointed out by nature.

Such (ſays this amiable philoſopher) is the education of kind nature, who from the beginning to the end of our lives makes the play of her ſcholars their moſt inſtructive leſſons, and has implanted in our mind the curioſity and the inductive propenſity by which we are enabled and diſpoſed to learn them. The exerciſe of this inductive principle, by which nature prompts us to infer general laws from the obſervation of particular facts, gives us a ſpecies of logic new in the ſchools, but old as

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as human nature. It is certainly a method of diſcovery; for by theſe means general principles, formerly unknown, have come into view.

74 Is a juſt logic.

It is a juſt and rational logic; for it is founded on, and indeed is only the habitual application of, this maxim, "That whatever is true with reſpect to every individual of a claſs of events, is true of the whole claſs." This is juſt the inverſe of the maxim on which the Ariſtotelian logic wholly proceeds, and is of equal authority in the court of reaſon. Indeed the expreſſion of the general law is only the abbreviated expreſſion of every particular inſtance.

This new logic, therefore, or the logic of induction, muſt not be conſidered as ſubordinate to the old, or founded on it. See Logic, Part III. chap. 5. In fact, the uſe and legitimacy of the Ariſtotelian logic is founded on the inductive,

All animals are mortal;
All men are animals; therefore
All men are mortal.

This is no argument to any perſon who chooſes to deny the mortality of man; even although he acknowledges his animal nature, he will deny the major propoſition.

It is beſide our purpoſe to ſhow, how a point ſo general, ſo congenial to man, and ſo familiar, remained ſo long unnoticed, although the diſquiſition is curious and ſatisfactory. It was not till within theſe two centuries that the increaſing demand for practical knowledge, particularly in the arts, made inquiſitive men ſee how uſeleſs and inſufficient was the learning of the ſchools in any road of inveſtigation which was connected with life and buſineſs; and obſerve, that ſociety had received uſeful information chiefly from perſons actually engaged in the arts which the ſpeculatiſts were endeavouring to illuſtrate; and that this knowledge conſiſted chiefly of experiments and obſervations, the only contributions which their authors could make to ſcience.

The *Novum Organum* of Bacon, which points out the true method of forming a body of real and uſeful knowledge, namely, the ſtudy of nature in the way of deſcription, obſervation, and experiment, is undoubtedly the nobleſt preſent that ſcience ever received. It may be conſidered as the grammar of nature's language, and is a counter-part to the logic of Ariſtotle; not exploding it, but making it effectual.

75 Its chief rule

As the logic of Ariſtotle had its rules, ſo has the Baconian or inductive; and this work, the *Novum Organum Scientiarum*, contains them all. The chief rule, and indeed the rule from which all the reſt are but derivations, is, that "the induction of particulars muſt be carried as far as the general affirmation which is deduced from them." If this be not attended to, the

76 for diſcovering general principles,

mind of man, which from his earlieſt years ſhows great eagerneſs in ſearching for firſt principles, will frequently aſcribe to the operation of a general principle events which are merely accidental. Hence the popular belief in omens, palmiſtry, and all kinds of fortune-telling.

This rule muſt evidently give a new turn to the whole track of philoſophical inveſtigation. In order to diſcover firſt principles, we muſt make extenſive and accurate obſervations, ſo as to have copious inductions of facts, that we may not be deceived as to the extent of the principle inferred from them. We muſt extend our acquaintance with the phenomena, paying a minute attention to what is going on all around us; and we muſt ſtudy nature, not ſhut up in our cloſet drawing the picture from our own fancy, but in the world, copying our lines from her own features.

To delineate human nature, we muſt ſee how men act. To give the philoſophy of the material world, we muſt notice its phenomena.

This method of ſtudying nature has been proſecuted during theſe two laſt centuries with great eagerneſs and ſucceſs. Philoſophers have been buſy in making accurate obſervations of facts, and copious collections of them. Men of genius have diſcovered points of reſemblance, from which they have been able to infer many general powers both of mind and body; and reſemblances among theſe have ſuggeſted powers ſtill more general.

By theſe efforts inveſtigation became familiar; philoſophers ſtudied the rules of the art, and became more expert; hypotheſes were baniſhed, and nothing was admitted as a principle which was not inferred from the moſt copious induction. Concluſions from ſuch principles became every day more conformable to experience. Miſtakes ſometimes happened; but recourſe being had to more accurate obſervation or more copious induction, the miſtakes were corrected. In the 77 and rectifying miſtakes.
preſent ſtudy of nature, our ſteps are more ſlow, and heſitating and painful; our concluſions are more limited and modeſt, but our diſcoveries are more certain and progreſſive, and the reſults are more applicable to the purpoſes of life. This pre-eminence of modern philoſophy over the ancient is ſeen in every path of inquiry. It was firſt remarkable in the ſtudy of the material world; and there it ſtill continues to be moſt conſpicuous. But it is no leſs to be ſeen in the later performances of philoſophers in metaphyſics, pneumatology, and ethics, where the mode of inveſtigation by analyſis and experiment has been greatly adopted; and we may add, that it is this juſter view of the employment which has reſtored philoſophers to the world, to ſociety. They are no longer to be found only in the academies of the ſophiſts and the cloiſters of a convent, but in the diſcharge of public and private duty. A philoſophic genius is a genius for obſervation as well as reflection, and he ſays, *Homo ſum, humani à me nihil alienum puto.*

78 Eſtimate of the philoſophic character.

After ſaying ſo much on the nature of the employment, and the mode of procedure, it requires no deep penetration to perceive the value of the philoſophical character. If there is a propenſity in the human mind which diſtinguiſhes us from the inferior orders of ſentient beings, without the leaſt circumſtance of interference, a propenſity which alone may be taken for the characteriſtic of the ſpecies, and of which no trace is to be found in any other, it is diſintereſted intellectual curioſity, a love of diſcovery for its own ſake, independent of all its advantages.

We think highly (and with great juſtice do we think ſo) of our rational powers; but we may carry this too far, as we do every ground of ſelf-eſtimation. To every man who enjoys the cheering thought of living under the care of a wiſe Creator, this boaſted prerogative will be viewed with more modeſty and diffidence; and He has given us evident marks of the rank in which He eſteems the rational powers of man. In no caſe that is of eſſential importance, of indiſpenſable neceſſity, not on-

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ly to our wellbeing but to our very exiſtence, has He left man to the care of his reaſon alone; for in the firſt inſtance, He has given us reaſon

To guide the helm, while paſſion blows the gale.

79 *We ſhould think modeſtly of our rational powers.*

God has not truſted either the preſervation of the individual or the continuance of the race to man's notions of the importance of the taſk, but has committed them to the ſurer guards of hunger and of ſexual deſire. In like manner, He has not left the improvement of his nobleſt work, the intellectual powers of the ſoul of man, to his own notions how important it is to his comfort that he be thoroughly acquainted with the objects around him.

80 *Importance of our inſtinctive principles.*

No: He has committed this alſo to the ſure hand of curioſity: and He has made this ſo ſtrong in a few ſuperior ſouls, whom He has appointed to give light and knowledge to the whole ſpecies, as to abſtract them from all other purſuits, and to engage them in intellectual reſearch with an ardour which no attainment can ever quench, but, on the contrary, inflames it the more by every draught of knowledge.

——————— But what need words
To paint its power? For this the daring youth
Breaks from his weeping mother's folding arms
In foreign climes to rove. The penſive ſage,
Heedleſs of ſleep, or midnight's hurtful vapour
Hangs o'er the ſickly taper.—Hence the ſcorn
Of all familiar proſpects, though beheld
With tranſport once. Hence the attentive gaze
Of young aſtoniſhment.
Such is the bounteous providence of Heaven,
In every breaſt implanting the deſire
Of objects new and ſtrange, to urge us on
With unremitting labour to attain
The ſacred ſtores that wait the rip'ning ſoul
In Truth's exhauſtleſs boſom. *Akenſide.*

But human life is not a ſituation of continual neceſſity; this would ill ſuit the plans of its beneficent Author: and it is from induction of phenomena totally oppoſite to this, and from ſuch induction alone, that we have ever thought of a wiſe Creator. His wiſdom appears only in His beneficence. Human life is a ſcene filled with enjoyment; and the ſoul of man is ſtored with propenſities and powers which have *pleaſure, in direct terms*, for their object. Another ſtriking diſtinction of our nature is a continual diſpoſition to refinement, of which few traces are to be found in the actions of other animals.

81 *Our diſpoſition to refinement.*

There is hardly a gift of nature ſo grateful in itſelf as to pleaſe the freakiſh mind of man till he has moulded it to his fancy. Not contented with food, with raiment, and with ſhelter, he muſt have nice cookery, ornamental dreſs, and elegant houſes. He hunts when he is not hungry, and he refines ſexual appetite into a moſt elegant paſſion. In like manner he has improved this anxious deſire of the knowledge of the objects around him, ſo as to derive from them the means of ſubſiſtence and comfort, into the moſt elegant and pleaſing of all gratifications, the accumulation of intellectual knowledge, independent of all conſideration of its advantages. And as every man has a title to the enjoyment of ſuch pleaſures as he can attain without injuring his neighbour; ſo it is allowable to ſuch as have got the means of intellectual improvement, without relinquiſhing the indiſpenſable ſocial duties, to puſh this advantage as far as it will go: and, in all ages and countries, it has been conſidered as forming the greateſt diſtinction between men of eaſy fortune and the poor, who muſt earn their ſubſiſtence by the ſweat of their brow. The plebeian muſt learn to work, the gentleman muſt learn to think; and nothing can be a ſurer mark of a groveling ſoul than for a man of fortune to have an uncultivated mind.

82 *Ought to be cheriſhed as far as it is ſubſervient to the duties of life.*

Let us then cheriſh to the utmoſt this diſtinguiſhing propenſity of the human ſoul: but let us do even this like philoſophers. Let us cultivate it as it is: as the handmaid to the arts and duties of life; as the guide to ſomething yet more excellent. A character is not to be eſtimated from what the perſon knows, but from what he can perform. The accumulation of intellectual knowledge is too apt to create an inordinate appetite for it: and the man habituated to ſpeculation is, like the miſer, too apt to place that pleaſure in the mere *poſſeſſion*, which he ought to look for only or chiefly in the *judicious uſe* of his favourite object. Like the miſer, too, his habits of hoarding up generally unfit him for the very enjoyment which at ſetting out he propoſed to himſelf. Seldom do we find the man, who has devoted his life to ſcientific purſuits for their own ſake, poſſeſſed of that ſuperiority of mind which the active employ to good purpoſe in times of perplexity; and much ſeldomer do we find him poſſeſſed of that promptitude of apprehenſion, and that deciſion of purpoſe, which are neceſſary for paſſing through the difficult ſcenes of human life.

But we may uſe the good things of this life without abuſing them; and by moderation here, as in all other purſuits, derive thoſe ſolid advantages which philoſophy is able to beſtow. And theſe advantages are great. To enumerate and deſcribe them would be to write a great volume. We may juſt take notice of one, which is an obvious conſequence of that ſtrict and ſimple view which we have given of the ſubject; and this is a modeſt opinion of our attainments.

83 *Limits of our knowledge.*

Appearances are all that we know; cauſes are for ever hid from our view; the powers of our nature do not lead us ſo far. Let us therefore, without heſitation, relinquiſh all purſuits which have ſuch things as ultimate principles for *objects of examination*. Let us attend to the ſubordinations of things which it is our great buſineſs to explore. Among theſe there is ſuch a ſubordination as that of means to ends, and of inſtruments to an operation. All will acknowledge the abſurdity of the project of viewing light with a microſcrope. It is equally abſurd for us to examine the nature of knowledge, of truth, of infinite wiſdom, by our intellectual powers. We have a wide field of acceſſible knowledge in the works of God; and one of the greateſt advantages, and of the moſt ſublime pleaſures, which we can derive from the contemplation, is the view which a judicious philoſophical reſearch will moſt infallibly give us of a world, not conſiſting of a number of detached objects, connected only by the fleeting tie of coexiſtence, but an *univerſe*, a *ſyſtem* of beings, all connected together by cauſation, with innumerable degrees of ſubordination and ſubſerviency, and all cooperating in the production of one great and glorious purpoſe. The heart which has but a ſpark of ſenſibility muſt be warmed by ſuch a proſpect, muſt be pleaſed to find itſelf an important part of this ſtupendous machine; and cannot but adore the incomprehenſible Ar-

View of Bacon's Philosophy.

tiſt who contrived, created, and directs the whole. Let us not liſten, then, to the timid admonitions of theological ignorance, which ſhrinks with ſuperſtitious horror from the thoughts of accounting for every thing by the powers of nature, and conſiders theſe attempts as an approach to atheiſm. Philoſophical diſquiſition will, on the contrary, exhibit theſe general laws of the univerſe, that wonderful concatenation and adjuſtment of every thing both material and intellectual, as the moſt ſtriking inſtance of incomprehenſible wiſdom; which, by means ſo few and ſo ſimple, can produce effects which by their grandeur dazzle our imagination, and by their multiplicity elude all poſſibility of enumeration. Of all the obſtacles which the weakneſs, the folly, or the ſinful vanity of men, has thrown in the way of the theologian, there is none ſo fatal, ſo hoſtile to all his endeavours, as a cold and comfortleſs ſyſtem of materialiſm, which the reaſoning pride of man firſt engendered, which made a figure among a few ſpeculatiſts in the laſt century, but was ſoon forgotten by the philoſophers really buſy with the obſervation of nature and of nature's God. It has of late reared up its head, being now cheriſhed by all who wiſh to get rid of the ſtings of remorſe, as the only opinion compatible with the peace of the licentious and the ſenſual: for we may ſay to them as Henry IV. ſaid to the prince of Wales, "Thy wiſh was father, Harry, to that thought." In vain will the divine attempt to lay this devil with the metaphyſical exorciſms of the ſchools; it is philoſophy alone that can detect the cheat. Philoſophy ſingles out the characteriſtic phenomena which diſtinguiſh every ſubſtance; and philoſophy never will heſitate in ſaying that there is a ſet of phenomena which characteriſe mind and another which characteriſe body, and that theſe are *toto cœlo* different. Continually appealing to fact, to the phenomena, for our knowledge of every cauſe, we ſhall have no difficulty in deciding that thought, memory, volition, joy, hope, are not compatible attributes with bulk, weight, elaſticity, fluidity. *Tuto ſub ægide Pallas;* philoſophy will maintain the dignity of human nature, will detect the ſophiſms of the materialiſts, confute their arguments; and ſhe alone will reſtore to the countenance of nature that ineffable beauty, of which thoſe would deprive her, who would take away the ſupreme Mind which ſhines from within, and gives life and expreſſion to every feature.

84 Philoſophical diſquiſition gives juſt notions of God and of our own ſouls.

PHI PHI

Philoſophy ‖ Philoſtratus.

Natural PHILOSOPHY. See NATURAL *Philoſophy*, PHILOSOPHY, and PHYSICS.

Experimental PHILOSOPHY. See EXPERIMENTAL *Philoſophy*.

Moral PHILOSOPHY. See MORAL *Philoſophy*.

PHILOSTORGIUS, an eccleſiaſtical hiſtorian of the 4th century, was born in Cappadocia, and wrote an abridgement of eccleſiaſtical hiſtory, in which he treats Athanaſius with ſome ſeverity. This work contains many curious and intereſting particulars. The beſt edition is that of Henry de Valois in Greek and Latin. There is alſo attributed to him a book againſt Porphyry.

PHILOSTRATUS, FLAVIUS, was an ancient Greek author. He wrote the Life of Apollonius Tyanenſis, and ſome other things which have come down to our time. Euſebius againſt Hierocles calls him an Athenian, becauſe he taught at Athens; but Eunapius and Suidas always ſpeak of him as a Lemnian: and he hints, in his Life of Apollonius, that he uſed to be at Lemnos when he was young. He frequented the ſchools of the ſophiſts; and he mentions his having heard Damianus of Epheſus, Proclus Naucratitas, and Hippodromus of Lariſſa. This ſeems to prove that he lived in the reign of the emperor Severus, from 193 to 212, when thoſe ſophiſts flouriſhed. He became known afterwards to Severus's wife Julia Auguſta, and was one of thoſe learned men whom this philoſophic empreſs had continually about her. It was by her command that he wrote the Life of Apollonius Tyanenſis, as he relates himſelf in the ſame place where he informs us of his connections with that learned lady. Suidas and Heſychius ſay that he was a teacher of rhetoric, firſt at Athens and then at Rome, from the reign of Severus to that of Philippus, who obtained the empire in 244.

Philoſtratus's celebrated work is his Life of Apollonius; which has erroneouſly been attributed to Lucian, becauſe it has been printed with ſome of that author's pieces. Philoſtratus endeavours, as Cyril obſerves, to repreſent Apollonius as a wonderful and extraordinary perſon; rather to be admired and adored as a god than to be conſidered as a mere man. Hence Eunapius, in the preface to his Lives of the Sophiſts, ſays that the proper title of that work would have been, *The Coming of a God to Men;* and Hierocles, in his book againſt the Chriſtians which was called *Philaletbes*, and which was refuted by Euſebius in a work ſtill extant, among other things drew a compariſon between Apollonius and Jeſus Chriſt. It has always been ſuppoſed that Philoſtratus compoſed his work with a view to diſcredit the miracles and doctrines of our Lord, by ſetting up other miracles and other doctrines againſt them; and this ſuppoſition may be true; but that Apollonius was really an impoſtor and magician may not be ſo certain. He may, for what we know, have been a wiſe and excellent perſon; and it is remarkable, that Euſebius, though he had the worſt opinion of Philoſtratus's hiſtory, ſays nothing ill of Apollonius. He concluded that that hiſtory was written to oppoſe the hiſtory of Jeſus; and the uſe which the ancient infidels made of it juſtifies his opinion; but he draws no information from it with regard to Apollonius. It would have been improper to have done ſo; ſince the ſophiſtical and affected ſtyle of Philoſtratus, the ſources from whence he owns his materials to have been drawn, and, above all, the abſurdities and contradictions with which he abounds, plainly ſhow his hiſtory to be nothing but a collection of fables, either invented or at leaſt embelliſhed by himſelf.

The works of Philoſtratus, however, have engaged the attention of critics of the firſt claſs. Græevius had intended to have given a correct edition of them, as appears

Philostratus, Philotis.

appears from the preface of Meric Casaubon to a dissertation upon an intended edition of Homer, printed at London in 1658, 8vo. So had Bentley, who designed to add a new Latin version of his notes; and Fabricius says that he saw the first sheet of Bentley's edition printed at Leipsic in 1691. Both these designs were dropped. A very exact and beautiful edition was published at length at Leipsic, 1709, in folio, by Olearius, professor of the Greek and Latin tongues in that university; who has proved himself perfectly qualified for the work he undertook, and shown all the judgement, learning, and industry, that are required in an excellent editor.

At the end of Apollonius's Life there are 95 letters which go under his name. They are not, however, believed to be his; the style of them being very affected, and like that of a sophist, while they bear in other respects all the marks of a forgery. Philostratus says that he saw a collection of Apollonius's Letters in Hadrian's library at Antium, but had not inserted them all among these. They are short, and have in them little else than moral sentences. The Lives of the Sophists contain many things which are to be met with nowhere else. The Heroics of Philostratus are only a dialogue between a vintner of Thracian Chersonesus and a Phœnician, in which the former draws characters of Homer's heroes, and represents several things differently from that poet; and this upon the faith of Protesilaus's ghost, who had lately visited his farm, which was not far from the tomb of this hero. Olearius conjectures, with much probability, that Philostratus's design in this dialogue was secretly to criticise some things in Homer, which he durst not do openly on account of the great veneration then paid to him, and for fear of the odium which Zoilus and others had incurred by censuring him too freely. The images are elegant descriptions and illustrations of some ancient paintings and other particulars relating to the fine arts; to which Olearius has subjoined the description of some statues by Callistratus; for the same reason that he subjoined Eusebius's book against Hierocles to the Life and Letters of Apollonius, namely, because the subjects of these respective works are related to each other. The last piece is a collection of Philostratus's Letters; but some of these, though it is not easy to determine which, were written by a nephew to our Philostratus, of the same name, as were also the last eighteen in the book of images. This is the reason why the title runs not *Philostrati*, but *Philostratorum quæ supersunt omnia*.

See Apollonius, and Blount (Charles).

There were many persons of the name of Philostratus among the ancients; and there were many other works of the Philostratus here recorded, but no others are extant besides those we have mentioned.

PHILOTIS, a servant maid at Rome, saved her countrymen from destruction. After the siege of Rome by the Gauls, the Fidenates assembled an army, and marched against the capital, demanding all the wives and daughters in the city as the only conditions of peace. This demand astonished the senators; and when they refused to comply, Philotis advised them to send all the female slaves disguised in matrons clothes, and she offered to march herself at the head. Her advice was followed; and when the Fidenates had feasted late in the evening, and were quite intoxicated and fallen asleep, Philotis lighted a torch as a signal for her countrymen to attack the enemy. The whole was successful; the Fidenates were conquered; and the senate, to reward the fidelity of the female slaves, permitted them to appear in the dress of the Roman matrons.

Philotis || Philyra.

PHILOXENUS, an officer of Alexander, who received Cilicia at the general division of the provinces.——A son of Ptolemy, who was given to Pelopidas as an hostage.——A dithyrambic poet of Cythera. He enjoyed the favour of Dionysius tyrant of Sicily for some time, till he offended him by seducing one of his female singers. During his confinement Philoxenus composed an allegorical poem called *Cyclops*; in which he had delineated the character of the tyrant under the name of Polyphemus, and represented his mistress under the name of Galatæa, and himself under that of Ulysses. The tyrant, who was fond of writing poetry, and of being applauded, removed Philoxenus from his dungeon; but the poet refused to purchase his liberty by saying things unworthy of himself, and applauding the wretched verses of Dionysius, and therefore he was sent to the quarries. Being set at liberty, he some time after was asked his opinion at a feast about some verses which Dionysius had just repeated, and which the courtiers had received with the greatest applause. Philoxenus gave no answer, but he ordered the guards that surrounded the tyrant's table to take him back to the quarries. Dionysius was pleased with his pleasantry and with his firmness, and immediately forgave him. Philoxenus died at Ephesus about 380 years before Christ.

PHILTER, or PHILTRE, (*Philtrum*), in *Pharmacy*, &c. a strainer.

PHILTER, is also used for a drug or preparation, which it is pretended will excite love.—The word is formed from the Greek φιλεω, "I love," or φιλος, "lover."

Philters are distinguished into *true* and *spurious*, and were given by the Greeks and Romans to excite love. The spurious are spells or charms, supposed to have an effect beyond the ordinary laws of nature by some magic virtue; such are those said to be given by old women, witches, &c.—The true philters are those supposed to work their effect by some natural and magnetical power. There are many grave authors who believe the reality of these philters, and allege matter of fact in confirmation of their sentiments: among the rest, Van Helmont, who says, that upon holding a certain herb in his hand for some time, and taking afterwards a little dog by the foot with the same hand, the dog followed him wherever he went, and quite deserted his former master; which he pretends to account for thus: The heat communicated to the herb, not coming alone, but animated by the emanations of the natural spirits, determines the herb towards the man, and identifies it to him: having then received this ferment, it attracts the spirit of the other object magnetically, and gives it an amorous motion. But this is mere cant; and all philters, whatever facts may be alleged, are mere chimeras.

PHILYCA. See PHYLICA, BOTANY *Index*.

PHILYRA, in fabulous history, was one of the Oceanides, whom Saturn met in Thrace. The god, to escape from the vigilance of Rhea, changed himself into a horse, to enjoy the company of Philyra, by whom he had a son half a man and half a horse, called *Chiron*.

Philyra

Philyra ‖ Phinehas.

Philyra was so ashamed of giving birth to such a monster, that she entreated the gods to change her nature. She was accordingly metamorphosed into a tree, called by her name among the Greeks.

PHIMOSIS, in *Medicine*, a disorder of the penis, in which the prepuce is so strict or tense, that it cannot be drawn back over the glans. See SURGERY.

PHINEHAS, or, as the Jews pronounce it PINEHAS, was the son of Eleazar, and grandson of Aaron. He was the third high-priest of the Jews, and discharged this office from the year of the world 2571, till towards the year 2590. He is particularly commended in Scripture for the zeal he showed in vindicating the glory of God, when the Midianites had sent their daughters into the camp of Israel, to tempt the Hebrews to fornication and idolatry. For Zimri having publicly entered into the tent of a Midianitish woman named *Cozbi*, Phinehas arose up from among the people (Numb. xxv. 7, &c.), took a javelin in his hand, entered after Zimri into that infamous place, and stabbed both man and woman at one blow, in those parts that were chiefly concerned in this criminal commerce. Upon which the plague or distemper ceased with which the Lord had already begun to punish the Israelites. This happened in the year of the world 2553.

Then the Lord said to Moses, Phinehas the son of Eleazar the high-priest has turned away my wrath from the children of Israel, because he has been zealous in my cause, and has hindered me from destroying them: wherefore acquaint him, that I give him my covenant of peace, and the priesthood shall be given to his posterity by a perpetual covenant, because he has been zealous for his God, and has made atonement for the crime of the children of Israel. This promise that the Lord made to Phinehas, to give him the priesthood by a perpetual covenant, interpreters observe, evidently included this tacit condition, that his children should continue faithful and obedient; since we know that the priesthood passed out of the family of Eleazar and Phinehas to that of Ithamar, and that it returned not to the posterity of Eleazar till after about 150 years.

This is what we find concerning the translation of the high-priesthood from one family to the other. This dignity continued in the race of Phinehas, from Aaron down to the high-priest Eli, for about 335 years. See AARON.

The manner and causes of this change are unknown. It re-entered again into the family of Eleazar, under the reign of Saul, when this prince having put to death Abimelech, and the other priests of Nob, he gave the high priesthood to Zadok, who was of the race of Phinehas. At the same time, David had Abiathar with him, of the race of Eli, who performed the functions of high-priest. So that after the death of Saul, David continued the priesthood to Zadok and Abiathar conjointly. But towards the end of David's reign, Abiathar having espoused the interest of Adonijah, to the prejudice of Solomon, he was in disgrace, and Zadok only was acknowledged as high-priest. The priesthood continued in his family till after the captivity of Babylon, and even to the destruction of the temple. But from the beginning of Zadok's priesthood alone, and the exclusion of Abiathar, to the ruin of the temple, is 1084 years.

We read of another memorable action of Phinehas, in which he still showed his zeal for the Lord. This was when the Israelites that were beyond Jordan had raised upon the banks of this river a vast heap of earth (Josh. xxii. 30, 31.). Those on the other side fearing they were going to forsake the Lord, and set up another religion, deputed Phinehas and other chief men among them, to go and inform themselves of the reason of erecting this monument. But when they had found that it was in commemoration of their union and common original, Phinehas took occasion from thence to praise the Lord, saying, "We know that the Lord is with us, since you are not guilty of that prevarication we suspected you were."

Phinehas, Phineus.

We do not exactly know the time of the death of Phinehas. But as he lived after the death of Joshua, and before the first servitude under Chushan-rishathaim, during the time that there were neither kings nor judges in the land, and every one did what was right in his own eyes (Judges xvii. 6. xviii. 1. xxi. 24.); his death is put about the year of the world 2590. It was under his pontificate that the story of Micah happened, as also that of the tribe of Dan, when they made a conquest of Laish; and the enormity that was committed upon the wife of the Levite of the mountain of Ephraim (Judges xx. 28.). Phinehas's successor in the high-priesthood was Abiezar, or Abishuah.

The Rabbins allow a very long life to Phinehas. There are some who believe he lived to the time of the high-priest Eli, or even to the time of Samson. Others will have it, that he was the same as Eli, or rather as the prophet Elias, which would still prolong his life for several ages.

PHINEUS, in fabulous history, was a son of Agenor, king of Phœnicia, or according to some of Neptune. He became king of Thrace, or, according to the greater part of mythologists, of Bithynia. He married Cleopatra the daughter of Boreas, called by some *Cleobula*, by whom he had Plexippus and Pandion. After her death, he married Idæa the daughter of Dardanus. Idæa, jealous of his former wife's children, accused them of attempts upon their father's life and crown, or, as others assert, of attempts upon her virtue; on which they were condemned by Phineus to be deprived of their eyes. This cruelty was soon after punished by the gods; for Phineus suddenly became blind, and the Harpies were sent by Jupiter to keep him in continual alarm, and to spoil the meats which were placed on his table. He was afterwards delivered from these dangerous monsters by his brothers-in-law Zetes and Calais, who pursued them as far as the Strophades. He likewise recovered his sight by means of the Argonauts, whom he had received with great hospitality, and whom he instructed in the easiest and speediest way of arriving in Colchis. The causes of the blindness of Phineus are a matter of dispute among the ancients; some supposing that this was inflicted by Boreas for his cruelty to his grandsons; while others attribute it to the anger of Neptune, because he had directed the sons of Phryxus how to escape from Colchis to Greece. Many, however, imagine that it proceeded from his having rashly attempted to develope futurity; while others assert that Zetes and Calais put out his eyes on account of his cruelty to their nephews. The second wife of Phineus is called by some *Dia*, *Eurytia*, *Danae*, and *Idothea*.—He was killed by Hercules.

PHLEBOTOMY,

PHLEBOTOMY, the opening of a vein with a proper ſharp-edged and pointed inſtrument, in order to let out a certain quantity of blood either for the preſervation or recovery of a perſon's health. See Surgery.

PHLEGM, in the animal economy, one of the four humours whereof the ancients ſuppoſed the blood to be compoſed. The chemiſts make phlegm or water an elementary body; the characters of which are fluidity, inſipidity, and volatility.

PHLEGMAGOGUES, in *Medicine*, a term anciently made uſe of for ſuch medicines as were ſuppoſed to be endowed with the property of purging off phlegm; ſuch as hermodactyls, agaric, turbith, jalap, &c.

PHLEGMATIC, among phyſicians, an appellation given to that habit or temperament of body wherein phlegm is predominant; which gives riſe to catarrhs, coughs, &c.

PHLEGMON, denotes an external inflammation and tumor, attended with a burning heat.

PHLEGON, who was ſurnamed *Trallianus*, was born in Trallis a city of Lydia. He was the emperor Hadrian's freed man, and lived to the 18th year of Antoninus Pius; as is evident from his mentioning the conſuls of that year. He wrote ſeveral works of great erudition, of which we have nothing left but fragments. Among theſe was a Hiſtory of the Olympiads, A Treatiſe of Long-lived Perſons, and another of Wonderful Things; the ſhort and broken remains of which Xylander tranſlated into Latin, and publiſhed at Baſil in 1568, with the Greek and with notes. Meurſius publiſhed a new edition of them with his notes at Leyden, in 1622. The titles of part of the reſt of Phlegon's writings are preſerved by Suidas. It is ſuppoſed that the Hiſtory of Hadrian, publiſhed under Phlegon's name, was written by Hadrian himſelf, from this paſſage of Spartianus: "Hadrian thirſted ſo much after fame (ſays he), that he gave the books of his own life, drawn up by himſelf, to his freedmen, commanding them to publiſh thoſe books under their own names; for we are told that Hadrian wrote Phlegon's books."

Phlegon's name has been more familiar among the moderns, and his fragments have had a greater degree of regard paid to them than perhaps they deſerve, merely becauſe he has been ſuppoſed to ſpeak of the darkneſs which prevailed during our Lord's paſſion. The book in which the words are contained is loſt; but Euſebius has preſerved them in his *Chronicon*. They are theſe: "In the 4th year of the 202d Olympiad, there was a greater and more remarkable eclipſe of the ſun than any that had ever happened before: for at the ſixth hour the day was ſo turned into the darkneſs of night, that the very ſtars in the firmament were viſible; and there was an earthquake in Bithynia which threw down many houſes in the city of Nicæa." Euſebius thinks that theſe words of Phlegon related to the prodigies which accompanied Chriſt's crucifixion; and many other fathers of the church have thought the ſame: but this opinion is liable to many difficulties; for no man had ever a ſtronger deſire than Phlegon to compile marvellous events, and to obſerve the ſupernatural circumſtances in them. How was it then poſſible that a man of this turn of mind ſhould not have taken notice of the moſt ſurpriſing circumſtance in the eclipſe which it is imagined he hints at, viz. its happening on the day when the moon was at the full? But had Phlegon done this, Euſebius would not have omitted it; and Origen would not have ſaid that Phlegon had omitted this particular.

It was a matter of controverſy ſome time ago, whether Phlegon really ſpoke of the darkneſs at the time of our Lord's paſſion; and many diſſertations were written on both ſides of the queſtion. This diſpute was occaſioned by the above paſſage from Phlegon being left out in an edition of Clarke's Boyle's Lectures, publiſhed after his death, at the inſtance of Sykes, who had ſuggeſted to Clarke, that an undue ſtreſs had been laid upon it. Whiſton, who informs us of this affair, expreſſes great diſpleaſure againſt Sykes, and calls "the ſuggeſtion groundleſs." Upon this, Sykes publiſhed "A Diſſertation on the Eclipſe mentioned by Phlegon: or, "An Inquiry whether that Eclipſe had any relation to the darkneſs which happened at our Saviour's Paſſion; 1732," 8vo. Sykes concludes it to be moſt probable that Phlegon had in view a natural eclipſe which happened November 24, in the firſt year of the 202d Olympiad, and not in the 4th year of the Olympiad in which Chriſt was crucified. Many pieces were written againſt him, and to ſome of them he replied; but perhaps it is a controverſy which concerns the learned world merely, ſince the cauſe of religion is but little affected by it.

Photius blames Phlegon for expatiating too much on trifles, and for collecting too great a number of anſwers pronounced by the oracles. "His ſtyle (he tells us) is not altogether flat and mean, nor does it everywhere imitate the attic manner of writing. But otherwiſe, the over nice accuracy and care with which he computes the Olympiads, and relates the names of the conteſts, the tranſactions, and even oracles, is not only very tireſome to the reader, whereby a cloud is thrown over all other particulars in that book, but the diction is thereby rendered unpleaſant and ungrateful; and indeed he is every moment bringing in the anſwers pronounced by all kinds of deities."

PHLOGISTON, a term uſed by chemiſts to denote a principle which was ſuppoſed to enter into the compoſition of various bodies.

The bodies which were thought to contain it in the largeſt quantity are ſuch as are inflammable; and the property which theſe ſubſtances poſſeſs of being ſuſceptible of inflammation was thought to depend on this principle; and hence it was ſometimes called the *Principle of Inflammability*. Inflammation, according to this doctrine, was the ſeparation of *this principle* or *phlogiſton* from the other matter which compoſed the combuſtible body. As its ſeparation was always attended with the emiſſion of light and heat, ſome chemiſts concluded that it was light and heat combined with other matter in a peculiar manner, or that it was ſome highly elaſtic and very ſubtile matter, on certain modifications of which heat and light depended.

Another claſs of bodies which were ſuppoſed to contain phlogiſton are the metals; and the chemiſts ſuppoſed that the peculiar luſtre of the metals depended on this principle. Of this they thought themſelves convinced by the evidence of their ſenſes in two ways; viz. firſt,

Phlogiston. because by exposing a metal to the action of a long continued heat, it lost its metallic lustre, and was converted into an earthy-like substance called *calx metallicus*, or *oxide*; and secondly, because by mixing this oxide with any inflammable substance whatever, and subjecting the mixture to certain operations, the inflammable matter disappeared, and the metal was restored to its former state and lustre, without suffering much diminution in quantity, especially if the processes had been conducted with care and attention.

This fact relative to the metals was thought to be a full demonstration of itself, independent of other proofs which were brought to support the doctrine. These were, that a combustible body, by the act of inflammation (i. e. by the dissipation of its phlogiston in the form of heat and light), was converted into a body that was no longer combustible, but which might have its property of combustibility restored to it again by mixing the incombustible remains with any kind of inflammable matter, and submitting the mixture to certain processes. In this way the body was restored to its former state of inflammability.

They were also at some pains to prove that the *phlogiston* or the *principle of inflammability* was the same in all inflammable bodies and in the metals. This identity of phlogiston they thought to be evident from the fact, that the calx of a metal might be restored to its metallic state, or that the remains after the combustion of a combustible body might be restored to its original state of combustibility by the addition of any inflammable body whatever, taken either from the animal, vegetable, or mineral kingdoms.

These and several other facts were brought to prove, not only the existence of phlogiston, but its effects in mixture with other substances; and the objections which were made against the doctrine were removed with wonderful ingenuity. The chief objection against it was, that if the inflammation of a combustible body, or the converfion of a metal into calx, depends on the dissipation or extrication of phlogiston; then it must follow, that the remains of a combustible body after inflammation, and the calx of the metal, must be less than the matter from which they were produced: but this is contrary to fact; for when we collect with care all the vapour into which the purest inflammable bodies are converted by combustion, these incombustible remains are much heavier than the inflammable body was from which they were produced, and the calx into which a metal is converted by long exposure to the action of heat is heavier than the metal from which it was produced. This consideration made several people doubt of the truth of the doctrine; but the objection was removed by saying, that phlogiston was so subtle, as not only to have no weight, but to possess an absolute levity; and that when it was taken from an absolutely heavy body, that body must, by losing so much absolute levity, become heavier, in the same manner as the algebraists say, that a positive quantity is augmented by the subtraction of a negative quantity. This sophism satisfied the minds of most of the chemists, especially those who were algebraists.

The opinion that phlogiston was heat and light somehow combined with other matter, was proved, not only by the fact, that heat and light were emitted from a combustible body during its combustion, but from the reduction of certain metallic calces to the original metallic state again, at least in some degree, by simple exposure to heat and light. The white calx of silver, for instance, when exposed in close sealed glass vessels to the light and heat of the sun, resumes a black tinge, and is in part restored to its metallic lustre without any addition whatever: but then this restoration, like the others above mentioned, is attended with a loss of weight.

Besides constituting the principal part of inflammable bodies and metals, phlogiston was thought to be the cause of colour in all vegetable and animal substances. This was concluded from the fact of plants growing white when defended from the action of the sun's rays, and in having their green colour restored by exposure to his rays again; and so far did the chemists suffer themselves to be deceived, that they actually thought the green colouring matter, which they extracted from fresh plants by certain chemical processes, to be an inflammable substance. A very material objection was made to this argument, viz. if plants owe their colour to phlogiston imparted by the sun's rays, why do the sun's rays destroy vegetable colours that are exposed to them? for we know that the sun's rays are very effectual in diminishing the lustre of cloth dyed with vegetable colours, and in bleaching or taking out various stains from linen and other substances. All this was removed by saying, that the sun's rays possessed different powers on living and on dead vegetable matter, and that the living vegetables had the power of absorbing phlogiston from the sun's rays, which dead vegetable matter had not.

Since the existence of phlogiston, as a chemical principle in the composition of certain bodies, is now fully proved to be false, we shall not trouble our readers with any farther observations on it, except adding, that although the chemists were satisfied with the proofs they gave of its reality, they were never able to exhibit it in a separate state, or show it in a pure form, unmixed with other matter.

Phlogiston seems to have been admitted as a principle in the composition of certain bodies, and to have been supposed the cause of certain modifications of matter, merely with a view to explain some of those natural phenomena which the authors of it were unable to explain on other principles. Subsequent discoveries in natural philosophy and in chemistry have represented things in a very different light from that in which the old chemists viewed them. The old chemists knew nothing but chemistry; they seldom extended their views to the observation of objects beyond their laboratories, and it was not till philosophers became chemists, and chemists philosophers, that chemistry began to wear the garb of science. The epoch in which this change began was in the time of Lord Verulam, who first removed the dimness from the chemist's eyes, and to him succeeded the honourable Mr Boyle. Sir Isaac Newton, with the little assistance which his predecessors in this branch of science afforded him, is in reality the first who established chemistry on scientific ground. It must, however, be acknowledged, that although he made a great progress, he left much undone; and subsequent chemists, who were less accurate observers of nature, admitted principles unwarrantably. From the time of Sir Isaac Newton till the middle of the 18th century, no real improvement was made in scientific chemistry; and the progress this science has made since that period is owing

owing to the important discovery of the existence of heat in a state of composition with other matter. Heat thus combined loses its activity or becomes insensible, just in the same way as any other active substance loses its apparent qualities in composition. Acids, for example, when combined in a certain proportion with substances for which they have strong attraction, as alkalies or absorbent earths, lose all their obvious acid qualities, and the compound turns out mild, and totally conceals the acid which it contains. In a similar manner, heat, when combined in certain proportions with other matter, loses its sensible qualities, and the compound conceals the heat which it contains. Heat, in this combined state, was called by its ingenious discoverer, Dr Black, *latent heat*, and it was found to be very abundant in the atmosphere, which owes its existence as an elastic fluid to the quantity of latent heat that it contains. After this discovery was made, Dr Crawford, considering that air was absorbed by a burning body, concluded that the heat which appears in the combustion of a combustible body, is the heat that had before existed in the air which was consumed by the burning body. M. Lavoisier and others, prosecuting this inquiry, found that the combustible body, while it is burning, unites with the basis of the air, and that the heat which the air contained, and which was the cause of the air existing in the state of air, is expelled. This absorption of the basis of the air by the burning body, and the reduction of this basis to a solid form, accounts for the increase of weight which a body acquires by burning; or, in other words, gives a reason why the matter into which a combustible body is converted by combustion, is heavier than the body from which it was produced. The same absorption of air is observable, when a metal is converted into a calx, and the additional weight of the calx is found to be precisely equal to the weight of the air absorbed during the calcination. On these principles, therefore, we now explain the phenomena in a much more satisfactory manner than by the supposition of phlogiston, or a principle of inflammability. See CHEMISTRY.

PHLOMIS, the SAGE-TREE, or *Jerusalem Sage*; a genus of plants belonging to the didynamia class. See BOTANY *Index*.

PHLOX, LYCHNIDEA, or *Bastard Lychnis*; a genus of plants belonging to the pentandria class. See BOTANY *Index*.

PHLYCTENÆ, in *Medicine*, small eruptions on the skin.

PHOCA, a genus of quadrupeds of the order of feræ. See MAMMALIA *Index*.

PHOCÆA, the last town of Ionia, (Mela, Pliny); of Æolis, (Ptolemy), because situated on the right or north side of the river Hermus, which he makes the boundary of Æolis to the south. It stood far in the land, on a bay or arm of the sea; had two very safe harbours, the one called *Lampter*, the other *Naustathmos*, (Livy). It was a colony of Ionians, situated in the territory of Æolis, (Herodotus). Massilia in Gaul was again a colony from it. *Phocæenses*, the people, (Livy); *Phocaicus*, the epithet, (Lucan); applied to *Marseilles*. It was one of the 12 cities which assembled in the panionium or general council of Ionia.

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Some writers tell us, that while the foundations of this city were laying, there appeared near the shore a great shoal of sea-calves; whence it was called *Phocæa*, the word *phoca* signifying in Greek a *sea-calf*. Ptolemy, who makes the river Hermus the boundary between Æolia and Ionia, places Phocæa in Æolis; but all other geographers reckon it among the cities of Ionia. It stood on the sea-coast, between Cuma to the north, and Smyrna to the south, not far from the Hermus; and was, in former times, one of the most wealthy and powerful cities of all Asia; but is now a poor beggarly village, though the see of a bishop. The Phocæans were expert mariners, and the first among the Greeks that undertook long voyages; which they performed in galleys of fifty oars. As they applied themselves to trade and navigation, they became acquainted pretty early with the coasts and islands of Europe, where they are said to have founded several cities, namely, Velia in Italy; Alalia, or rather Aleria, in Corsica; and Marseilles in Gaul. Neither were they unacquainted with Spain; for Herodotus tells us, that in the time of Cyrus the Great, the Phocæans arriving at Sartessus, a city in the bay of Cadiz, were treated with extraordinary kindness by Arganthonius king of that country; who, hearing that they were under no small apprehension of the growing power of Cyrus, invited them to leave Ionia, and settle in what part of his kingdom they pleased. The Phocæans could not be prevailed upon to forsake their country; but accepted a large sum of money, which that prince generously presented them with, to defray the expence of building a strong wall round their city. The wall they built on their return; but it was unable to resist the mighty power of Cyrus, whose general Harpagus, investing the city with a numerous army, soon reduced it to the utmost extremities. The Phocæans, having no hopes of any succour, offered to capitulate; but the conditions offered by Harpagus seeming severe, they begged he would allow them three days to deliberate; and in the mean time, withdraw his forces. Harpagus, though not ignorant of their design, complied with their request. The Phocæans, taking advantage of this condescension, put their wives, children, and all their most valuable effects, on board several vessels which they had ready equipped, and conveyed them safe to the island of Chios, leaving the Persians in possession of empty houses. Their design was to purchase the Oenessian islands, which belonged to the Chians, and settle there. But the Chians not caring to have them so near, lest they should engross all the trade to themselves, as they were a seafaring people, they put to sea again; and, having taken Phocæa, their native country, by surprise, put all the Persians they found in it to the sword. They went to Corsica; great part of them however returned very soon, as did the rest also in a few years. They then lived in subjection either to the Persians, or tyrants of their own. Among the latter we find mention made of Laodamus, who attended Darius Hystaspis in his expedition against the Scythians; and of Dionysius, who, joining Aristagoras, tyrant of Miletus, and chief author of the Ionian rebellion, retired, after the defeat of his countrymen, to Phœnicia, where he made an immense booty, seizing on all the ships he met with trading to that country. From Phœnicia he sailed to Sicily, where he committed great depredations on the Carthaginians and Tuscans; but is said never to have molested the Greeks.

In the Roman times the city of Phocæa sided with Antiochus

Phocæa. Phocas.

Antiochus the Great; whereupon it was besieged, taken, and plundered by the Roman general; but allowed to be governed by its own laws. In the war which Aristonicus brother to Attalus, king of Pergamus, raised against the Romans, they assisted the former to the utmost of their power; a circumstance which so displeased the senate, that they commanded the town to be demolished, and the whole race of the Phocæans to be utterly rooted out. This severe sentence would have been put in execution, had not the Massilienses, a Phocæan colony, interposed, and, with much difficulty, assuaged the anger of the senate. Pompey declared Phocæa a free city, and restored the inhabitants to all the privileges they had ever enjoyed; whence, under the first emperors, it was reckoned one of the most flourishing cities of all Asia Minor. This is all we have been able to collect from the ancients touching the particular history of Phocæa.

PHOCAS, a Roman centurion, was raised to the dignity of emperor by the army, and was crowned at Constantinople about the year 603. The emperor Mauritius, who was thus deserted both by the army and the people, fled to Chalcedon with his five children, whom Phocas caused to be inhumanly murdered before his eyes, and then he murdered Mauritius himself, his brother, and several other persons who were attached to that family.

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Phocas, thus proclaimed and acknowledged at Constantinople, sent, according to custom, his own image and that of his wife Leontia to Rome, where they were received with loud acclamations, the people there being incensed against Mauritius on account of the cruel exactions of the exarchs, and his other ministers in Italy. Gregory, surnamed the Great, then bishop of Rome, caused the images to be lodged in the oratory of the martyr Cæsarius, and wrote letters to the new emperor, congratulating him upon his advancement to the throne, which he said was effected by a particular providence, to deliver the people from the innumerable calamities and heavy oppressions under which they had long groaned. Had we no other character of Phocas and Leontia but that which has been conveyed to us in Gregory's letters, we should rank him amongst the best princes mentioned in history; but all other writers paint him in quite different colours; and his actions, transmitted to us by several historians, evidently speak him a most cruel and blood-thirsty tyrant. He was of middling stature, says Cedrenus, deformed, and of a terrible aspect: his hair was red, his eye-brows met, and one of his cheeks was marked with a scar, which, when he was in a passion, grew black and frightful: he was greatly addicted to wine and women, blood thirsty, inexorable, bold in speech, a stranger to compassion, in his principles a heretic. He endeavoured, in the beginning of his reign, to gain the affections of the people by celebrating the Circensian games with extraordinary pomp, and distributing on that occasion large sums among the people; but finding that instead of applauding they reviled him as a drunkard, he ordered his guards to fall upon them. Some were killed, many wounded, and great numbers were dragged to prison: but the populace rising, set them at liberty, and thenceforth conceived an irreconcileable aversion to the tyrant.

As soon as the death of Mauritius was known, Narses, who then commanded the troops quartered on the frontiers of Persia, revolted. Phocas, however, managed matters so as to gain him over to his interest, and then treacherously and cruelly burnt him alive. He endeavoured to strengthen his cause by respectable alliances; but his cruelty was such as to render him generally hated, for he spared neither sex nor age, and amongst others he murdered Constantina the widow of Mauritius, and her daughters. These cruelties were at length the cause of his downfall. He became universally hateful; and persons in great authority near his person conspired against him. This conspiracy, however, was discovered, and the persons concerned in it were all put to death. The following year, however, 610, he was overtaken by the fate he had so long deserved.

Heraclius, the son of the governor of Africa, who bore the same name, taking upon him the title of emperor, and being acknowledged as such by the people of Africa, sailed from thence with a formidable fleet, and a powerful army on board, for Constantinople, while Nicetas marched thither by way of Alexandria and the Pentapolis. Heraclius steered his course to Abydus, where he was received with great demonstrations of joy by several persons of rank, who had been banished by Phocas. From Abydus he sailed to Constantinople, where he engaged and utterly defeated the tyrant's fleet. Phocas took refuge in the palace; but one Photinus, whose wife he had formerly debauched, pursuing him with a party of soldiers, forced the gates, dragged the cowardly emperor from the throne, and having stripped him of the imperial robes, and clothed him with a black vest, carried him in chains to Heraclius, who commanded first his hands and feet, then his arms, and at last his head, to be cut off: the remaining part of his body was delivered up to the soldiers, who burnt it in the forum. We are told, that Heraclius having reproached him with his evil administration, he answered, with great calmness, "It is incumbent upon you to govern better." Such was the end of this cruel tyrant, after he had reigned seven years and some months.

Phocas ‖ Phocion.

PHOCILIDES, a Greek poet and philosopher of Miletus, flourished about 540 years before the Christian era. The poetical piece now extant, attributed to him, is not of his composition, but of another poet who lived in the reign of Adrian.

PHOCION was a distinguished Athenian general and orator in the time of Philip II. of Macedon. His character is thus described in the Ancient Universal History. "He was too modest to solicit command, nor did he promote wars that he might raise his authority by them; though, taken either as a soldier, orator, statesman, or general, he was by far the most eminent Athenian of his time. As he was a most disinterested patriot, he could entertain no great affection for Philip: but as he perfectly well knew the disposition of his countrymen, and how unlikely they were long to support such measures as were necessary to humble the Macedonian power, he did not express himself vehemently, but chose rather to cultivate the esteem which on all occasions Philip showed for the state of Athens, as a mean of preserving her, when she should be reduced to that situation which he conceived they wanted virtue to prevent. From this character the reader will easily discern that Demosthenes

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Phocion.

Demosthenes and he could not well agree. The former was always warm, his language copious, and his designs extensive; and Phocion, on the other hand, was of a mild temper, delivered his opinion in very few words, and proposed schemes at once necessary and easy to be effected. Yet he seldom or never concurred with the people, but spoke as poignantly against their vices as Demosthenes himself; insomuch, that this orator once told him, 'The Athenians, Phocion, in some of their mad fits, will murder thee.' 'The same (answered he) may fall to thee, Demosthenes, if ever they come to be sober.'

He was afterwards appointed to command the army which was sent to assist the Byzantines against Philip, whom he obliged to return to his own dominions. This truly great man, whom (though extremely poor) no sum could bribe to betray his country, and who at every risk on all occasions gave them sound advice, was at length accused by his ungrateful countrymen. This event happened in the year before Christ 318. He was sent to Athens by Polyperchon head of a faction in Macedonia, together with his friends, chained in carts, with this message, "That though he was convinced they were traitors, yet he left them to be judged by the Athenians as a free people." Phocion demanded whether they intended to proceed against him by form of law; and some crying out that they would, Phocion demanded how that could be if they were not allowed a fair hearing: but perceiving, by the clamour of the people, that no such thing was to be expected, he exclaimed, "As for myself, I confess the crime objected to me, and submit to the judgment of the law; but consider, O ye Athenians, what have these poor innocent men done that they should be involved in the same calamity with me?" The people replied with great vociferation, "They are your accomplices, and that is enough." Then the decree was read, adjudging them all to death, viz. Phocion, Nicocles, Aheudippus, Agamon, and Pythocles; these were present: Demetrius Phalereus, Callimedon, Charicles, and others, were condemned in their absence. Some moved that Phocion might be tortured before he was put to death; nay, they were for bringing the rack into the assembly, and torturing him there. The majority, however, thought it enough if he was put to death, for which the decree was carried unanimously; some putting on garlands of flowers when they gave their votes. As he was going to execution, a person who was his intimate friend asked him if he had any message for his son? "Yes," replied Phocion; "tell him it is my last command that he forget how ill the Athenians treated his father."

The spleen of his enemies was not extinguished with his life: they passed a decree whereby his corpse was banished the Athenian territories; they likewise forbade any Athenians to furnish fire for his funeral pile. One Conopian took up the corpse, and carried it beyond Eleusina, where he borrowed some fire of a Megarian woman and burned it. A Megarian matron, who attended with her maid, raised on the place an honorary monument; and having gathered up the bones, carried them home, and buried them under her own hearth; praying at the same time thus to the Penates: "To you, O ye gods, guardians of this place, I commit the precious remains of the most excellent Phocion. Protect them, I beseech you, from all insults; and deliver them one day to be reposited in the sepulchre of his ancestors, when the Athenians shall become wiser." It was not long before this opportunity occurred. When the Athenians began to cool a little, and remember the many services they had received from Phocion, they decreed him a statue of brass; ordered his bones to be brought back at the public expence; and decreed that his accusers should be put to death. Agnonides, who was principally concerned in that tragedy, suffered; but Epicurus and Demophilus, who were also accomplices in it, fled. However, Phocion's son met with them, and executed his revenge upon them; which was almost the only good action he ever performed, as he had a very small share of his father's abilities, and not any of his virtues. Such is the fickleness and such the injustice of popular governments; failings which, if we are to judge from universal experience, are absolutely inseparable from them.

Phocion, Phocis.

PHOCIS, (Demosthenes, Strabo, Pausanias); a country of Greece, contained between Bœotia to the east and Locris to the west, but extending formerly from the Sinus Corinthiacus on the south to the sea of Eubœa on the north, and, according to Dionysius, as far as Thermopylæ; but reduced afterwards to narrower bounds. *Phocenses*, the people; *Phocicus*, the epithet, (Justin); *Bellum Phocicum*, the sacred war which the Thebans and Philip of Macedon carried on against them for plundering the temple at Delphi; and by which Philip paved the way to the sovereignty of all Greece, (Justin). Its greatest length was from north to south, that is, from 38° 45′ to 39° 20′, or about 35 miles; but very narrow from east to west, not extending to 30 miles, that is, from 23° 10′ to 23° 40′ at the widest, but about 23 miles towards the Corinthian bay, and much narrower still towards the north. This country is generally allowed to have taken its name from Phocus the son of Ornytion, a native of Corinth; but having been soon after invaded by the Eginetæ, under the conduct of another Phocus, who was the son of Eacus king of Enopia, the memory of the first insensibly gave way to that of the second.

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In Phocis there were many celebrated mountains, such as Cythæron, HELICON, and PARNASSUS. The last two we have already noticed in the order of the alphabet. Cythæron was consecrated to the muses as well as the other two, and was consequently much celebrated by the poets. Both it and Helicon contend with Mount Parnassus for height and magnitude. There were no remarkable rivers in Phocis except Cephisus, which runs from the foot of Parnassus northward, and empties itself in the Pindus, which was near the boundary of that kingdom. It had several very considerable cities; such as Cyrra, Crissa, and Antecyra, which, according to Ptolemy, were on the sea coasts; and Pythia, Delphi, Daulis, Elatia, Ergosthenia, and Baulia, which were inland towns. Elatia was the largest and richest after Delphi.

Deucalion was king of that part of Phocis which lies about Parnassus, at the time that Cecrops flourished in Attica; but the Phocians afterwards formed themselves into a commonwealth, to be governed by their general assemblies, the members of which were chosen from among themselves, and were changed as often as occasion required. Of the history of the Phocians but little is known till the time of the holy war, of which

Phocis ‖ Phœnicia.

we have the following account in the Ancient Universal History.

"The Phocians having presumed to plough the territories of the city of Cyrra, consecrated to the Delphic god, were summoned by the other Grecian states before the court of the Amphictyons, where a considerable fine was imposed upon them for their sacrilege. They refused to pay it, on pretence that it was too large; and at the next assembly their dominions were adjudged confiscated to the use of the temple. This second sentence exasperated the Phocians still more; who, at the instigation of one Philomelus, or, as he is called by Plutarch, Philomedes, seized upon the temple, plundered it of its treasure, and held the sacred depositum for a considerable time. This second crime occasioned another assembly of the Amphictyons, the result of which was a formal declaration of war against the Phocians. The quarrel being become more general, the several states took part in it according to their inclinations or interest. Athens, Sparta, and some others of the Peloponnesians, declared for the Phocians; and the Thebans, Thessalians, Locrians, and other neighbouring states, against them. A war was commenced with great fury on both sides, and styled *the holy war*, which lasted ten years; during which the Phocians, having hired a number of foreign troops, made an obstinate defence, and would in all probability have held out much longer had not Philip of Macedon given the finishing stroke to their total defeat and punishment. The war being ended, the grand council assembled again, and imposed an annual fine of 60 talents upon the Phocians, to be paid to the temple, and continued till they had fully repaired the damage it had sustained from them; and, till this reparation should be made, they were excluded from dwelling in walled towns, and from having any vote in the grand assembly. They did not, however, continue long under this heavy sentence: their known bravery made their assistance so necessary to the rest, that they were glad to remit it; after which remission they continued to behave with their usual courage and resolution, and soon obliterated their former guilt."

We cannot finish this article without mentioning more particularly Daulis, rendered famous, not so much for its extent or richness, as for the stature and prowess of its inhabitants; but still more for the inhuman repast which was served up to Tereus king of Thrace by the women of this city, by whom he was soon after murdered for the double injury he had done to his sister-in-law Philomela, daughter of Pandion king of Athens. See PHILOMELA.

PHOEBUS, one of the names given by ancient mythologists to the Sun, Sol, or Apollo. See APOLLO.

PHOENICIA, or more properly PHOENICE, the ancient name of a country lying between the 34th and 36th degrees of north latitude; bounded by Syria on the north and east, by Judæa on the south, and by the Mediterranean on the west. Whence it borrowed its name is not absolutely certain. Some derive it from one Phœnix; others from the Greek word *phœnix*, signifying a *palm* or *date*, as that tree remarkably abounded in this country. Some again suppose that Phœnice is originally a translation of the Hebrew word *Edom*, from the Edomites who fled thither in the days of David. By the contraction of Canaan it was also called *Chna*, and anciently *Rhabbothin* and *Colpitis* (A). The Jews commonly named it *Canaan*; though some part of it, at least, they knew by the name of *Syrophœnice* (B). Bochart tells us that the most probable etymology is *Phene Anak*, i. e. "the descendants of Anak." Such were the names peculiar to this small country; though Phœnice was sometimes extended to all the maritime countries of Syria and Judea, and Canaan to the Philistines, and even to the Amalekites. On the contrary, these two names, and the rest, were most generally swallowed up by those of Palestine and Syria (C).

Phœnicia. Ancient Univ. Hist. vol. ii.

There is some disagreement among authors with respect to the northern limits of this country. Ptolemy makes the river Eleutherus the boundary of Phœnice to the north; but Pliny, Mela, and Stephanus, place it in the island of Aradus, lying north of that river. Strabo observes, that some will have the river Eleutherus to be the boundary of Seleucis, on the side of Phœnice and Cœlesyria. On the coast of Phœnice, and south of the river Eleutherus, stood the following cities: SIMYRA, Orthosia, TRIPOLIS, Botrys, Byblus, Palæbyblus, Berytus, SIDON, SAREPTA, TYRUS, Palætyrus.

Phœnice extended, according to Ptolemy, even beyond Mount Carmel; for that geographer places in Phœnice not only Ecdippa and Ptolemais, but Sycaminum and Dæra, which stand south of that mountain. These, however, properly speaking, belonged to Palestine. We will not take upon us to mark out the bounds of the midland Phœnice. Ptolemy reckons in it the following towns; Arca, Palæbyblus (Old Byblus), Gabala, and Cæsaria Paniæ. This province was considerably extended in the times of Christianity; when, being considered as a province of Syria, it included not only Damascus but Palmyra also.

The soil of this country is good, and productive of many necessaries for food and clothing. The air is wholesome, and the climate agreeable. It is plentifully watered by small rivers; which, running down from Mount Libanus, sometimes swell to an immoderate degree, either increased by the melting of the snows on that mountain, or by heavy rains. Upon these occasions they overflow, to the great danger and hinderance of the traveller and damage of the country. Among these rivers is that of ADONIS.

It

(A) This last name is a translation of the first. *Rabhotsen* is in Hebrew a *great gulf* or *bay*. From *rabhotsen*, by changing the Hebrew *ts* into the Greek *t*, comes *rabboten*; and, with a little variation, *rhabbothin*. Κολπος, *colpos*, is Greek also for a *bay* or *gulf*; whence it appears that *colpitis* or *colpites* is a translation of *rabbothin*.

(B) Bochart supposes that the borderers, both upon the Phœnician and Syrian side, were called by the common name of Syrophœnicians, as partaking equally of both nations.

(C) Or rather Phœnice, Palestine, and Syria, were promiscuously used for each other, and particularly the two former. Phœnice and Palestine, says Stephanus Byzantinus, were the same. As for Syria, we have already observed, that in its largest extent it sometimes comprehended Phœnice and Cœlesyria. Herodotus plainly confounds these three names; we mean, uses one for the other indifferently.

Phœnicia.

It is univerfally allowed that the Phœnicians were Canaanites (D) by defcent: nothing is plainer or lefs contefted, and therefore it were time loft to prove it. We fhall only add, that their blood muft have been mixed with that of foreigners in procefs of time, as it happens in all trading places; and that many ftrange families muft have fettled among them, who could confequently lay no claim to this remote origin, how much foever they may have been called Phœnicians, and reckoned of the fame defcent with the ancient proprietors.

The Phœnicians were governed by kings; and their territory, as fmall a flip as it was, included feveral kingdoms; namely, thofe of Sidon, Tyre, Aradus, Berytus, and Byblus. In this particular they imitated and adhered to the primitive government of their forefathers; who, like the other Canaanites, were under many petty princes, to whom they allowed the fovereign dignity, referving to themfelves the natural rights and liberties of mankind. Of their civil laws we have no particular fyftem.

With regard to religion, the Phœnicians were the moft grofs and abominable idolaters. The Baal-berith, Baalzebub, Baalfamen, &c. mentioned in Scripture, were fome of the Phœnician gods; as were alfo the Moloch, Afhtaroth, and Thammuz, mentioned in the facred writings.—The word *Baal*, in itfelf an appellative, was no doubt applied to the true God, until he rejected it on account of its being fo much profaned by the idolaters. The name was not appropriated to any particular deity among the idolatrous nations, but was common to many; however, it was generally imagined that one great God prefided over all the reft. Among the Phœnicians this deity was named *Baal-famen;* whom the Hebrews would have called *Baal-fhemim*, or the God of heaven. In all probability this was alfo the principal Carthaginian deity, though his Punic name is unknown. We have many religious rites of the Carthaginians handed down to us by the Greek and Roman writers; but they all beftowed names of their own gods upon thofe of the Carthaginians, which leads us to a knowledge of the correfpondence between the characters of the Phœnician and European deities. The principal deity of Carthage, according to Diodorus Siculus, was Chronus or Saturn. The facrifices offered up to him were children of the beft families. Our author alfo tells us, that the Carthaginians had a brazen ftatue or coloffus of this god, the hands of which were extended in act to receive, and bent downwards in fuch a manner, that the child laid thereon immediately fell down into a hollow where there was a fiery furnace. He adds alfo, that this inhuman practice feemed to confirm a tradition, handed down to the Greeks from very early antiquity, viz. that Saturn devoured his own children.

The goddefs Cœleftis, or Urania, was held in the higheft veneration by the Carthaginians. She is thought to have been the fame with the queen of heaven mentioned in Jeremiah, the Juno Olympia of the Greeks. According to Hefychius, the fame word applied in the Punic language both to Juno and Venus: Nay, the ancient Greeks frequently confound Juno, Venus, and Diana or the moon, all together; which is to be attributed to the Egyptians and Phœnicians, from whom they received their fyftem of religion; who feem in the moft ancient times to have had but one name for them all. Befides thefe there were feveral other deities of later date, who were worfhipped among the Phœnicians, particularly thofe of Tyre, and confequently among the Carthaginians alfo. Thefe were Jupiter, Apollo, Mars, and Bacchus. Jupiter was worfhipped under the name of *Belus* or *Baal*. To him they addreffed their oaths; and placed him for the moft part, as there is reafon to believe, at the head of their treaties. The fame name was alfo given to the other two, whence they were frequently miftaken for one another. Apollo or the fun, went either by this name fimply, or by others of which this made a part.

The Carthaginian fuperftition, however, was not confined to thefe deities alone. They worfhipped alfo the fire, air, and other elements; and had gods of rivers, meads, &c. Nay, they paid divine honours to the fpirits of their heroes, and even to men and women themfelves while yet in life; and in this adoration Hannibal the Great had for fome time a fhare, notwithftanding the infamous conduct of his countrymen towards him at laft. In order to worfhip thofe gods with more conveniency on all occafions, the Carthaginians had a kind of portable temples. Thefe were only covered chariots, in which were fome fmall images reprefenting their favourite deities; and which were drawn by oxen. They were alfo a kind of oracle; and their refponfes were underftood by the motion impreffed upon the vehicle. This was likewife an Egyptian or Libyan cuftom; and Tacitus informs us that the ancient Germans had fomething of the fame kind. The tabernacle of Moloch is thought to have been a machine of this kind; and it is not improbable that the whole was derived from the tabernacle of the Jews in the wildernefs.

Befides all the deities above mentioned, we ftill find another, named the *Dæmon* or *Genius* of Carthage, mentioned in the treaty made by Philip of Macedon and Hannibal. What this deity might be, we know not; however, it may be obferved, that the pagan world in general believed in the exiftence of dæmons, or intelligences who had a kind of middle nature between gods and men, and to whom the adminiftration of the world was in a great meafure committed. Hence it is no wonder that they fhould have received religious honours. For when once mankind were poffeffed with the opinion that they were the minifters of the gods, and trufted with the difpenfation of their favours, as well as the infliction,

(D) Bochart infinuates that the Canaanites were afhamed of their name, on account of the curfe denounced on their progenitor, and terrified by the wars fo vigoroufly and fuccefsfully waged on them by the Ifraelites, purely becaufe they were Canaanites; and that therefore, to avoid the ignominy of the one and the danger of the other, they abjured their old name, and changed it for Phœnicians, Syrians, Syrophœnicians, and Affyrians. Heidegger conjectures alfo that they were afhamed of their anceftor Canaan.

Phœnicia. fliction of their punishments, it is natural to suppose that they would be desirous of making their addresses to them. See ASTARTE and POLYTHEISM.

Herodotus supposes the Phœnicians to have been circumcised; but Josephus asserts, that none of the nations included under the vague name of Palestine and Syria used that rite, the Jews excepted; so that if the Phœnicians had anciently that custom, they came in time to neglect it, and at length wholly laid it aside. They abstained however from the flesh of swine.

Much is said of their arts, sciences, and manufactures; but as what we find concerning them is couched in general terms only, we cannot descant on particulars. The Sidonians, under which denomination we comprehend the Phœnicians in general, were of a most happy genius. They were from the beginning addicted to philosophical exercises of the mind; insomuch that a Sidonian, by name Moschus, taught the doctrine of atoms before the Trojan war: and Abomenus of Tyre puzzled Solomon by the subtility of his questions. Phœnice continued to be one of the seats of learning, and both Tyre and Sidon produced their philosophers of later ages; namely, Boethus and Diodatus of Sidon, Antipater of Tyre, and Apollonius of the same place; who gave an account of the writings and disciples of Zeno. For their language, see PHILOLOGY, N° 61. As to their manufactures, the glass of Sidon, the purple of Tyre, and the exceeding fine linen they wove, were the product of their own country, and their own invention: and for their extraordinary skill in working metals, in hewing timber and stone; in a word, for their perfect knowledge of what was solid, great, and ornamental in architecture—we need only put the reader in mind of the large share they had in erecting and decorating the temple at Jerusalem under their king Hiram. Their fame for taste, design, and ingenious invention, was such, that whatever was elegant, great, or pleasing, whether in apparel, vessels, or toys, was distinguished by way of excellence with the epithet of Sidonian.

The Phœnicians were likewise celebrated merchants, navigators, and planters of colonies in foreign parts. As merchants, they may be said to have engrossed all the commerce of the western world: as navigators, they were the boldest, the most experienced, and greatest discoverers, of the ancient times: they had for many ages no rivals. In planting colonies they exerted themselves so much, that considering their habitation was little more than the slip of ground between Mount Libanus and the sea, it is surprising how they could furnish such supplies of people, and not wholly depopulate their native country.

It is generally supposed that the Phœnicians were induced to deal in foreign commodities by their neighbourhood with the Syrians, who were perhaps the most ancient of those who carried on a considerable and regular trade with the more eastern regions: and this conjecture appears probable at least; for their own territory was but small and little able to afford any considerable exports, if we except manufactures: but that their manufactures were anyways considerable till they began to turn all the channels of trade into their own country, it is hard to believe. In Syria, which was a large country, they found store of productions of the natural growth of that soil, and many choice and useful commodities brought from the east. Thus, having Phœnicia. a safe coast, with convenient harbours, on one side, and excellent materials for ship-building on the other; perceiving how acceptable many commodities that Syria furnished would be in foreign parts, and being at the same time, perhaps, shown the way by the Syrians themselves, who may have navigated the Mediterranean—they turned all their thoughts to trade and navigation, and by an uncommon application soon eclipsed their masters in that art.

It were in vain to talk of the Edomites, who fled hither in David's time; or to inquire why Herodotus supposes the Phœnicians came from the Red sea: their origin we have already seen. That some of the Edomites fled into this country in the days of David, and that they were a trading people, is very evident: what improvements they brought with them into Phœnice, it is hard to say; and by the way, it is as difficult to ascertain their numbers. In all probability they brought with them a knowledge of the Red sea, and of the south parts of Arabia, Egypt, and Ethiopia; and by their information made the Phœnicians acquainted with those coasts; by which means they were enabled to undertake voyages to those parts, for Solomon, and Pharaoh Necho, king of Egypt.

Their whole thoughts were employed on schemes to advance their commerce. They affected no empire but that of the sea; and seemed to aim at nothing but the peaceable enjoyment of their trade. This they extended to all the known parts they could reach; to the British isles, commonly understood by the Cassiterides; to Spain, and other places in the ocean, both within and without the straits of Gibraltar; and, in general, to all the ports of the Mediterranean, the Black sea, and the lake Mæotis. In all these parts they had settlements and correspondents, from which they drew what was useful to themselves, or might be so to others; and thus they exercised the three great branches of trade, as it is commonly divided into importation, exportation, and transportation, in full latitude. Such was their sea-trade; and for that which they carried on by land in Syria, Mesopotamia, Assyria, Babylonia, Persia, Arabia, and even in India, it was of no less extent, and may give us an idea of what this people once was, how rich and how deservedly their merchants are mentioned in Scripture as equal to princes. Their country was, at that time, the great warehouse, where every thing that might either administer to the necessities or luxury of mankind was to be found; which they distributed as they judged would be the best for their own interest. The purple of Tyre, the glass of Sidon, and the exceeding fine linen made in this country, together with other curious pieces of art in metals and wood, already mentioned, appear to have been the chief and almost only commodities of Phœnice itself. Indeed their territory was so small, that it is not to be imagined they could afford to export any of their own growth; it is more likely that they rather wanted than abounded with the fruits of the earth.

Having thus spoken in general terms of their trade, we shall now touch upon their shipping and some things remarkable in their navigation. Their larger embarkations were of two sorts; they divided them into round ships or gauli; and long ships, galleys, or triremes. When they drew up in line of battle, the gauli were disposed

posed at a small distance from each other in the wings, or in the van and the rear: their triremes were contracted together in the centre. If, at any time, they observed that a stranger kept them company in their voyage, or followed in their track, they were sure to get rid of him if they could, or deceive him if possible; in which policy they went so far, as to venture the loss of their ships, and even their lives; so jealous were they of foreigners, and so tenaciously bent on keeping the whole trade to themselves. In order to discourage other nations from engaging in commerce, they practised piracy, or pretended to be at war with such as they met when they thought themselves strongest. This was but a natural stroke of policy in people who grasped at the whole commerce of the then known world. We must not forget here the famous fishery of Tyre, which so remarkably enriched that city. See ASTRONOMY, N° 7. OPHIR, and TYRE.

PHOENICOPTERUS, or FLAMINGO, a genus of birds belonging to the order of grallæ. See ORNITHOLOGY *Index*.

PHOENIX, in *Astronomy*. See ASTRONOMY *Index*.

PHOENIX, the *Great Palm*, or *Date tree*, a genus of plants belonging to the order of palmæ. See BOTANY *Index*. As the account of this valuable plant already given in its proper place, under BOTANY, is rather short to be satisfactory, we shall here enter a little more into the detail of its natural history. There is only one species, viz. the dactylifera, or common date-tree, a native of Africa and eastern countries, where it grows to 50, 60, and 100 feet high. The trunk is round, upright, and studded with protuberances, which are the vestiges of the decayed leaves. From the top issues forth a cluster of leaves or branches eight or nine feet long, extending all around like an umbrella, and bending a little towards the earth. The bottom part produces a number of stalks like those of the middle, but seldom shooting so high as four or five feet. These stalks, says Adanson, diffuse the tree very considerably; so that, wherever it naturally grows in forests, it is extremely difficult to open a passage through its prickly leaves. The date-tree was introduced into Jamaica soon after the conquest of the island by the Spaniards. There are, however, but few of them in Jamaica at this time. The fruit is somewhat in the shape of an acorn. It is composed of a thin, light, and glossy membrane, somewhat pellucid and yellowish; which contains a fine, soft, and pulpy fruit, which is firm, sweet, and somewhat vinous to the taste, esculent, and wholesome; and within this is inclosed a solid, tough, and hard kernel, of a pale gray colour on the outside, and finely marbled within like the nutmeg. For medicinal use dates are to be chosen large, full, fresh, yellow on the surface, soft and tender, not too much wrinkled; such as have a vinous taste, and do not rattle when shaken. They are produced in many parts of Europe, but never ripen perfectly there. The best are brought from Tunis; they are also very fine and good in Egypt and in many parts of the east. Those of Spain and France look well; but are never perfectly ripe, and very subject to decay. They are preserved three different ways; some pressed and dry; others pressed more moderately, and again moistened with their own juice; and others not pressed at all, but moistened with the juice of other dates, as they are packed up, which is done in baskets or skins. Those preserved in this last way are much the best. Dates have always been esteemed moderately strengthening and astringent.

Though the date tree grows everywhere indiscriminately on the northern coasts of Africa, it is not cultivated with care, except beyond Mount Atlas; because the heat is not sufficiently powerful along the coasts to bring the fruits to proper maturity. We shall here extract some observations from Mr Des Fontaines respecting the manner of cultivating it in Barbary, and on the different uses to which it is applied. All that part of the Zaara which is near Mount Atlas, and the only part of this vast desert which is inhabited, produces very little corn; the soil being sandy, and burnt up by the sun, is almost entirely unfit for the cultivation of grain, its only productions of that kind being a little barley, maize, and sorgo. The date-tree, however, supplies the deficiency of corn to the inhabitants of these countries, and furnishes them with almost the whole of their subsistence. They have flocks of sheep; but as they are not numerous, they preserve them for the sake of their wool; besides, the flesh of these animals is very unwholesome food in countries that are excessively warm; and these people, though ignorant, have probably been enabled by experience to know that it was salutary for them to abstain from it. The date trees are planted without any order, at the distance of 12 feet one from the other, in the neighbourhood of rivulets and streams which issue from the sand. Forests of them may be seen here and there, some of which are several leagues in circumference. The extent of these plantations depends upon the quantity of water which can be procured to water them: for they require much moisture. All these forests are intermixed with orange, almond, and pomegranate trees, and with vines which twist round the trunks of the date trees; and the heat is strong enough to ripen the fruit, though they are never exposed to the sun.

Along the rivulets and streams, dykes are erected to stop the course of their waters, in order that they may be distributed amongst the date trees by means of small canals. The number of canals is fixed for each individual; and in several cantons, to have a right to them, the proprietors are obliged to pay an annual sum proportionable to the number and extent of their plantations. Care is taken to till the earth well, and to raise a circular border around the root of each tree, that the water may remain longer and in larger quantity. The date trees are watered in every season, but more particularly during the great heats of summer.

It is generally in winter that new plantations of this tree are formed. For this purpose those who cultivate them take shoots of those which produce the best dates, and plant them at a small distance one from the other. At the end of three or four years these shoots, if they have been properly taken care of, begin to bear fruit; but this fruit is as yet dry, without sweetness, and even without kernels; they never reach the highest degree of perfection of which they are susceptible till they are about 15 or 20 years old.

These plants are however produced from the seeds taken out of the fruit, provided they are fresh. They should be sown in pots filled with light rich earth, and plunged into a moderate hotbed of tanners bark, which should

Phoenix. ſhould be kept in a moderate temperature of heat, and the earth frequently refreſhed with water. When the plants are come up to a proper ſize, they ſhould be each planted in a ſeparate ſmall pot, filled with the ſame light earth, and plunged into a hotbed again, obſerving to refreſh them with water, as alſo to let them have air in proportion to the warmth of the ſeaſon and the bed in which they are placed. During the ſummer time they ſhould remain in the ſame hotbed; but in the beginning of Auguſt, they ſhould have a great ſhare of air to harden them againſt the approach of winter; for if they are too much forced, they will be ſo tender as not to be preſerved through the winter without much difficulty, eſpecially if you have not the conveniency of a bark ſtove to keep them in. The ſoil in which theſe plants ſhould be placed, muſt be compoſed in the following manner, viz. half of light freſh earth taken from a paſture-ground, the other half ſea ſand and rotten dung or tanners bark in equal proportion; theſe ſhould be carefully mixed, and laid in a heap three or four months at leaſt before it is uſed, but ſhould be often turned over to prevent the growth of weeds, and to ſweeten the earth.

The trees, however, which ſpring from ſeed never produce ſo good dates as thoſe that are raiſed from ſhoots; they being always poor and ill taſted. It is undoubtedly by force of cultivation, and after ſeveral generations, that they acquire a good quality.

The date trees which have been originally ſown, grow rapidly, and we have been aſſured that they bear fruit in the fourth or fifth year. Care is taken to cut the inferior branches of the date tree in proportion as they riſe; and a piece of the root is always left of ſome inches in length, which affords the eaſy means of climbing to the ſummit. Theſe trees live a long time, according to the account of the Arabs; and in order to prove it, they ſay that when they have attained to their full growth, no change is obſerved in them for the ſpace of three generations.

The number of females which are cultivated is much ſuperior to that of the males, becauſe they are much more profitable. The ſexual organs of the date tree grow, as is well known, upon different ſtalks, and theſe trees flower in the months of April and May, at which time the Arabs cut the male branches to impregnate the female. For this purpoſe, they make an inciſion in the trunk of each branch which they wiſh to produce fruit, and place in it a ſtalk of male flowers; without this precaution the date tree would produce only abortive fruit (A). In ſome cantons the male branches are only ſhaken over the female. The practice of impregnating the date tree in this manner is very ancient. Pliny deſcribes it very accurately in that part of his work where he treats of the palm tree. Phoenix.

There is ſcarcely any part of the date tree which is not uſeful. The wood, though of a ſpongy texture, laſts ſuch a number of years, that the inhabitants of the country ſay it is incorruptible. They employ it for making beams and inſtruments of huſbandry; it burns ſlowly, but the coals which reſult from its combuſtion are very ſtrong, and produce a great heat.

The Arabs ſtrip the bark and fibrous parts from the young date trees, and eat the ſubſtance which is in the centre; it is very nouriſhing, and has a ſweet taſte: it is known by the name of the marrow of the date tree. They eat alſo the leaves, when they are young and tender, with lemon juice; the old ones are laid out to dry, and are employed for making mats and other works of the ſame kind, which are much uſed, and with which they carry on a conſiderable trade in the interior parts of the country. From the ſides of the ſtumps of the branches which have been left ariſe a great number of delicate filaments, of which they make ropes, and which might ſerve to fabricate cloth.

Of the freſh dates and ſugar, ſays Haſſelquiſt, the Egyptians make a conſerve, which has a very pleaſant taſte. In Egypt they uſe the leaves as fly-flaps, for driving away the numerous inſects which prove ſo troubleſome in hot countries. The hard boughs are uſed for fences and other purpoſes of huſbandry; the principal ſtem for building. The fruit, before it is ripe, is ſomewhat aſtringent; but when thoroughly mature, is of the nature of the fig. The Senegal dates are ſhorter than thoſe of Egypt, but much thicker in the pulp, which is ſaid to have a ſugary agreeable taſte, ſuperior to that of the beſt dates of the Levant.

A white liquor, known by the name of *milk*, is drawn alſo from the date tree. To obtain it, all the branches are cut from the ſummit of one of theſe trees, and after ſeveral inciſions have been made in it, they are covered with leaves, in order that the heat of the ſun may not dry it.

The ſap drops down into a veſſel placed to receive it, at the bottom of a circular groove, made below the inciſions. The milk of the date tree has a ſweet and agreeable taſte when it is new; it is very refreſhing, and it is even given to ſick people to drink, but it generally turns ſour at the end of 24 hours. Old trees are choſen for this operation, becauſe the cutting of the branches, and the large quantity of ſap which flows from them, greatly exhauſt them, and often cauſe them to decay.

The male flowers of the date tree are alſo uſeful. Th

(A) The celebrated Linnæus, in his Diſſertation on the Sexes of Plants, ſpeaking of the date tree, ſays, "A female date-bearing palm flowered many years at Berlin without producing any ſeeds; but the Berlin people taking care to have ſome of the bloſſoms of the male tree, which was then flowering at Leipſic, ſent to them by the poſt, they obtained fruit by theſe means; and ſome dates, the offspring of this impregnation, being planted in my garden, ſprung up, and to this day continue to grow vigorouſly. Kœmpfer formerly told us, how neceſſary it was found by the oriental people, who live upon the produce of palm-trees, and are the true *Lotophagi*, to plant ſome male trees among the females, if they hoped for any fruit; hence it is the practice of thoſe who make war in that part of the world to cut down all the male palms, that a famine may afflict their proprietors; ſometimes even the inhabitants themſelves deſtroy the male trees when they dread an invaſion, that their enemies may find no ſuſtenance in the country."

Phoenix.

They are eaten when ſtill tender, mixed up with a little lemon juice. They are reckoned to be very provocative: the odour which they exhale is probably the cauſe of this property being aſcribed to them.

Theſe date trees are very lucrative to the inhabitants of the deſert. Some of them produce 20 bunches of dates; but care is always taken to lop off a part of them, that thoſe which remain may become larger; 10 or 12 bunches only are left on the moſt vigorous trees.

It is reckoned that a good tree produces, one year with another, about the value of 10 or 12 ſhillings to the proprietor. A pretty conſiderable trade is carried on with dates in the interior part of the country, and large quantities of them are exported to France and Italy. The crop is gathered towards the end of November. When the bunches are taken from the tree, they are hung up in ſome very dry place where they may be ſheltered and ſecure from inſects.

Dates afford wholeſome nouriſhment, and have a very agreeable taſte when they are freſh. The Arabs eat them without ſeaſoning. They dry and harden them in the ſun, to reduce them to a kind of meal, which they lay up in ſtore to ſupply themſelves with food during the long journeys which they often undertake acroſs their deſerts. This ſimple food is ſufficient to nouriſh them for a long time.—The inhabitants of the Zaara procure alſo from their dates a kind of honey which is exceedingly ſweet. For this purpoſe they chooſe thoſe which have the ſofteſt pulp; and having put them into a large jar with a hole in the bottom, they ſqueeze them by placing over them a weight of eight or ten pounds.—The moſt fluid part of the ſubſtance, which drops through the hole, is what they call the *honey* of the date.

Even the ſtones, though very hard, are not thrown away. They give them to their camels and ſheep as food, after they have bruiſed them or laid them to ſoften in water.

The date, as well as other trees which are cultivated, exhibits great variety in its fruit, with reſpect to ſhape, ſize, quality, and even colour. There are reckoned to be at leaſt twenty different kinds. Dates are very liable to be pierced by worms, and they ſoon corrupt in moiſt or rainy weather.

From what has been ſaid, it may eaſily be perceived, that there is, perhaps, no tree whatever uſed for ſo many and ſo valuable purpoſes as the date tree.

Phoenix, in antiquity, a famous bird, which is generally looked upon by the moderns as fabulous. The ancients ſpeak of this bird as ſingle, or the only one of its kind; they deſcribe it as of the ſize of an eagle; its head finely creſted with a beautiful plumage, its neck covered with feathers of a gold colour, and the reſt of its body purple, only the tail white, and the eyes ſparkling like ſtars: they hold, that it lives 500 or 600 years in the wilderneſs; that when thus advanced in age, it builds itſelf a pile of ſweet wood and aromatic gums, and fires it with the wafting of its wings, and thus burns itſelf; and that from its aſhes ariſes a worm, which in time grows up to be a phœnix. Hence the Phœnicians gave the name of *phœnix* to the palm-tree; becauſe when burnt down to the root it riſes again fairer than ever.

In the ſixth book of the Annals of Tacitus, ſect. 28. it is obſerved that, in the year of Rome 787, the phœnix reviſited Egypt; which occaſioned among the learned much ſpeculation. This being is ſacred to the ſun. Of its longevity the accounts are various. The common perſuaſion is, as we have mentioned above, that it lives 500 years; though by ſome the date is extended to 1461. The ſeveral eras when the phœnix has been ſeen are fixed by tradition. The firſt, we are told, was in the reign of Seſoſtris; the ſecond is that of Amaſis; and, in the period when Ptolemy the third of the Macedonian race was ſeated on the throne of Egypt, another phœnix directed its flight towards Heliopolis. When to theſe circumſtances are added the brilliant appearance of the phœnix, and the tale that it makes frequent excurſions with a load on its back, and that when, by having made the experiment through a long tract of air, it gains ſufficient confidence in its own vigour, it takes up the body of its father and flies with it to the altar of the ſun to be there conſumed; it cannot but appear probable, that the learned of Egypt had enveloped under this allegory the philoſophy of comets.

Phoenix, ſon of Amyntor king of Argos by Cleobule or Hippodamia, was preceptor to young Achilles. His father having proved faithleſs to his wife, through fondneſs for a concubine called *Clytia*, Cleobule, who was jealous of him, perſuaded her ſon Phœnix to ingratiate himſelf with his father's miſtreſs. Phœnix eaſily ſucceeded; but Amyntor diſcovering his intrigues, he drew a curſe upon him, and the ſon was ſoon after deprived of his ſight by divine vengeance. Some ſay that Amyntor himſelf put out his ſon's eyes, which ſo cruelly provoked him that he meditated the death of his father. Reaſon and piety, however, prevailed over paſſion; and that he might not become a parricide, Phœnix fled from Argos to the court of Peleus king of Phthia. Here he was treated with tenderneſs; Peleus carried him to Chiron, who reſtored his eyeſight; ſoon after which he was made preceptor to Achilles, his benefactor's ſon. He was alſo preſented with the government of many cities, and made king of the Dolopes. He went with his pupil to the Trojan war; and Achilles was ever grateful for the inſtructions and precepts which he had received from him. After the death of Achilles, Phœnix, with others, was commiſſioned by the Greeks to return into Greece, to bring to the war young Pyrrhus. This commiſſion he ſucceſsfully performed; and after the fall of Troy, he returned with Pyrrhus, and died in Thrace. He was buried, according to Strabo, near Trachinia, where a ſmall river in the neighbourhood received the name of *Phœnix*. There was another Phœnix, ſon of Agenor, by a nymph who was called *Telephaſſa*, according to Apollodorus and Moſchus, or, according to others, *Epimeduſa*, *Perimeda*, or *Agriope*. He was, like his brother Cadmus, and Cilix, ſent by his father in purſuit of his ſiſter Europa, whom Jupiter had carried away under the form of a bull; and when his inquiries proved unſucceſsful, he ſettled in a country, which, according to ſome, was from him called *Phœnicia*. From him, as ſome ſuppoſe, the Carthaginians were called *Pœni*.

Pholas.

PHOLAS, a genus of ſhell-fiſh belonging to the order of vermes teſtacea. See Conchology *Index*.

The word *pholas* is derived from the Greek, and ſignifies ſomething which lies hid. This name they derive from

Pholas. from their property of making themſelves holes in the earth, ſand, wood, or ſtone, and living in them. The means of their getting there, however, are as yet entirely unknown. All that we can know with certainty is, that they muſt have penetrated theſe ſubſtances when very ſmall; becauſe the entrance of the hole in which the pholas lodges is always much leſs than the inner part of it, and indeed than the ſhell of the pholas itſelf. Hence ſome have ſuppoſed that they were hatched in holes accidentally formed in ſtones, and that they naturally grew of ſuch a ſhape as was neceſſary to fill the cavity.

The holes in which the pholades lodge are uſually twice as deep, at leaſt, as the ſhells themſelves are long; the figure of the holes is that of a truncated cone, excepting that they are terminated at the bottom by a rounded cavity, and their poſition is uſually ſomewhat oblique to the horizon. The openings of theſe holes are what betray the pholas being in the ſtone; but they are always very ſmall in proportion to the ſize of the fiſh. There ſeems to be no progreſſive motion of any animal in nature ſo ſlow as that of the pholas; it is immerſed in the hole, and has no movement except a ſmall one towards the centre of the earth; and this is only proportioned to the growth of the animal. Its work is very difficult in its motion; but it has great time to perform it in, as it only moves downward, ſinking itſelf deeper in the ſtone as it increaſes itſelf in bulk. That part by means of which it performs this, is a fleſhy ſubſtance placed near the lower extremity of the ſhell; it is of the ſhape of a lozenge, and is conſiderably large in proportion to the ſize of the animal; and though it be of a ſoft ſubſtance, it is not to be wondered at that in ſo long a time it is able, by conſtant work, to burrow into a hard ſtone. The manner of their performing this may be ſeen by taking one of them out of the ſtone, and placing it upon ſome ſoft clay; for they will immediately get to work in bending and extending that part allotted to dig for them, and in a few hours they will bury themſelves in the mud in as large a hole as they had taken many years to make in the ſtone. They find little reſiſtance in ſo ſoft a ſubſtance; and the neceſſity of their hiding themſelves evidently makes them haſten their work. The animal is lodged in the lower half of the hole in the ſtone, and the upper half is filled up by a pipe of a fleſhy ſubſtance and conic figure, truncated at the end: this they uſually extend to the orifice of the hole, and place on a level with the ſurface of the ſtone; but they ſeldom extend it any farther than this. The pipe, though it appears ſingle, is in reality compoſed of two pipes, or at leaſt it is compoſed of two parts ſeparated by a membrane. The uſe of this pipe or proboſcis is the ſame with that of the proboſcis of other ſhell-fiſh, to take in ſea water into their bodies, and afterwards to throw it out again. In the middle of their bodies they have a ſmall green veſſel, the uſe of which has not yet been diſcovered. This, when plunged in ſpirit-of-wine, becomes of a purple colour; but its colour on linen does not become purple in the ſun like that of the murex.

The pholas is remarkable for its luminous quality, which was noticed by Pliny, who obſerves that it ſhines in the mouth of the perſon who eats it: and if it touch his hands or clothes, it makes them luminous. He alſo ſays that the light depends upon its moiſture. The light of this fiſh has furniſhed matter for various obſervations and experiments to M. Reaumur and the Bolognian academicians, eſpecially Beccarius, who took ſo much pains with the ſubject of phoſphoreal light. Pholas.

M. Reaumur obſerves, that whereas other fiſhes give light when they tend to putreſcence, this is more luminous in proportion to its being freſh; that when they are dried, their light will revive if they be moiſtened either with freſh or ſalt water, but that brandy immediately extinguiſhes it. He endeavoured to make this light permanent, but none of his ſchemes ſucceeded.

The attention of the Bolognian academicians was engaged to this ſubject by M. F. Marſilius in 1744, who brought a number of theſe fiſhes, and the ſtones in which they were incloſed, to Bologna, on purpoſe for their examination.

Beccarius obſerved, that though this fiſh ceaſed to ſhine when it became putrid, yet that in its moſt putrid ſtate it would ſhine, and make the water in which it was immerſed luminous when it was agitated. Galeatius and Montius found that wine or vinegar extinguiſhed this light; that in common oil it continued ſome days, but in rectified ſpirit of wine or urine hardly a minute.

In order to obſerve in what manner this light was affected by different degrees of heat, they made uſe of a Reaumur's thermometer, and found that water rendered luminous by thoſe fiſhes increaſed in light till the heat arrived to 45^{0}, but that it then became ſuddenly extinct, and could not be revived again.

In the experiments of Beccarius, a ſolution of ſea-ſalt increaſed the light of the luminous water; a ſolution of nitre did not increaſe it quite ſo much. Sal ammoniac diminiſhed it a little, oil of tartar *per deliquium* nearly extinguiſhed it, and the acids entirely. This water, poured upon freſh calcined gypſum, rock-cryſtal, ceruſe, or ſugar, became more luminous. He alſo tried the effects of it when poured upon various other ſubſtances, but there was nothing very remarkable in them. Afterwards, uſing luminous milk, he found that oil of vitriol extinguiſhed the light, but that of tartar increaſed it.

This gentleman had the curioſity to try how differently coloured ſubſtances were affected by this kind of light; and having, for this purpoſe, dipped ſeveral ribbons in it, the white came out the brighteſt, next to this was the yellow, and then the green: the other colours could hardly be perceived. It was not, however, any particular colour, but only light, that was perceived in this caſe. He then dipped boards painted with the different colours, and alſo glaſs tubes filled with ſubſtances of different colours, in water rendered luminous by the fiſhes. In both theſe caſes, the red was hardly viſible, the yellow was the brighteſt, and the violet the dulleſt. But on the boards, the blue was nearly equal to the yellow, and the green more languid; whereas in the glaſſes, the blue was inferior to the green.

Of all the liquors to which he put the pholades, milk was rendered the moſt luminous. A ſingle pholas made ſeven ounces of milk ſo luminous, that the faces of perſons might be diſtinguiſhed by it, and it looked as if it were tranſparent.

Air appeared to be neceſſary to this light: for when Beccarius put the luminous milk into glaſs tubes, no agitation would make it ſhine unleſs bubbles of air were mixed

ed with it. Also Montius and Galeatius found, that, in an exhausted receiver, the pholas lost its light, but the water was sometimes made more luminous: which they ascribed to the rising of bubbles of air through it.

Beccarius, as well as Reaumur, had many schemes to render the light of these pholades permanent. For this purpose he kneaded the juice into a kind of paste with flour, and found that it would give light when it was immersed in warm water; but it answered best to preserve the fish in honey. In any other method of preservation, the property of becoming luminous would not continue longer than six months, but in honey it had lasted above a year; and then it would, when plunged in warm water, give as much light as ever it had done. See Barbut's *Genera Vermium*, p. 14. &c.

PHOLEYS, or Foulies, are a people of Africa, of very peculiar manners. Some authors tell us, that the kingdom of Pholey, from whence they derive their name, is divided from that of Jaloff by a lake called in the language of the Mundingoes *Cayor*; and that it stretches from east to west about 180 miles; but that, though it extends a great way south, its limits in that direction are not exactly ascertained.

Mr Moore, however, gives a very different account, and says, that the Pholeys live in clans, build towns, and are in every kingdom and country on each side of the river; yet are not subject to any of the kings of the country, though they live in their territories; for if they are used ill in one nation, they break up their towns, and remove to another. They have chiefs of their own, who rule with such moderation, that every act of government seems rather an act of the people than of one man. This form of government is easily administered, because the people are of a good and quiet disposition, and so well instructed in what is just and right, that a man who does ill exposes himself to universal contempt.

The natives of all these countries, not being avaricious of land, desire no more than they can use; and as they do not plough with horses or other cattle, they can use but very little; and hence the kings willingly allow the Pholeys to live in their dominions, and cultivate the earth.

The Pholeys have in general a tawney complexion, though many of them are of as deep a black as the Mundingoes; and it is supposed that their alliances with the Moors have given them the mixed colour between the true olive and the black. They are rather of a low stature, but have a genteel and easy shape, with an air peculiarly delicate and agreeable.

Though they are strangers in the country, they are the greatest planters in it. They are extremely industrious and frugal, and raise much more corn and cotton than they consume, which they sell at reasonable rates; and are so remarkable for their hospitality, that the natives esteem it a blessing to have a Pholey town in their neighbourhood; and their behaviour has gained them such reputation, that it is esteemed infamous for any one to treat them in an unhospitable manner. Their humanity extends to all, but they are doubly kind to people of their race; and if they know of any one of their body being made a slave, they will readily redeem him. As they have plenty of food, they never suffer any of their own people to want; but support the old, the blind, and the lame, equally with the others.

These people are seldom angry; and Mr Moore observes that he never heard them abuse each other; yet this mildness is far from proceeding from want of courage, they being as brave as any people of Africa, and very expert in the use of their arms, which are javelins, cutlasses, bows and arrows, and upon occasion guns. They usually settle near some Mundingo town, there being scarce any of note up the river that has not a Pholey town near it. Most of them speak Arabic, which is taught in their schools; and they are able to read the Koran in that language, though they have a vulgar tongue called *Pholey*. They are strict Mahometans, and scarce any of them will drink brandy, or any thing stronger than sugar and water.

They are so skilful in the management of cattle, that the Mundingoes leave theirs to their care. The whole herd belonging to a town feed all day in the savannahs, and after the crop is off, in the rice-grounds. They have a place without each town for their cattle, surrounded by a circular hedge, and within this enclosure they raise a stage about eight feet high, and eight or ten feet wide, covered with a thatched roof; all the sides are open, and they ascend to it by a ladder. Round this stage they fix a number of stakes, and when the cattle are brought up at night, each beast is tied to a separate stake with a strong rope made of the bark of trees. The cows are then milked, and four or five men stay upon the stage all night with their arms to guard them from the lions, tygers, and other wild beasts. Their houses are built in a very regular manner, they being round structures, placed in rows at a distance from each other to avoid fire, and each of them has a thatched roof somewhat resembling a high-crowned hat.

They are also great huntsmen, and not only kill lions, tygers, and other wild beasts, but frequently go 20 or 30 in a company to hunt elephants; whose teeth they sell, and whose flesh they smoke-dry and eat, keeping it for several months together. As the elephants here generally go in droves of 100 or 200, they do great mischief by pulling up the trees by the roots, and trampling down the corn; to prevent which, when the natives have any suspicion of their coming, they make fires round their corn to keep them out.

They are almost the only people who make butter, and sell cattle at some distance up the river. They are very particular in their dress, and never wear any other clothes but long robes of white cotton, which they make themselves. They are always very clean, especially the women, who keep their houses exceedingly neat. They are, however, in some particulars very superstitious: for if they chance to know that any person who buys milk of them boils it, they will from thenceforth on no consideration sell that person any more, from their imagining that boiling the milk makes the cows dry.

PHOLIS, in *Natural History*, is an old name for gypsums or plaster-stones. The name is derived from φολὶς, a *scale* or *small flake*, because they are composed of particles of that form.

Pholis, in *Ichthyology*, is the name of a small anguilliform fish. The back is brown, the belly is white, the whole back and sides are spotted, and the skin is soft, free of scales, but with a tough mucilaginous mat-

ter like the eel. This ſpecies moſt of all approaches to the *alauda*: and though uſually larger, yet Mr Ray doubts whether it really differs from it in any thing eſſential; the diſtinction is its colour, which though a very obvious is certainly a very precarious one.

PHONICS, the doctrine or ſcience of ſound, otherwiſe called ACOUSTICS, which ſee.

PHORMIUM, FLAX-PLANT, (*Phormium tenax*, Forſt.) is a name which we may give to a plant that ſerves the inhabitants of New Zealand inſtead of hemp and flax. Of this plant there are two ſorts; the leaves of both reſemble thoſe of flags, but the flowers are ſmaller, and their cluſters more numerous: in one kind they are yellow, and in the other a deep red. Of the leaves of theſe plants, with very little preparation, they make all their common apparel, and alſo their ſtrings, lines, and cordage, for every purpoſe; which are ſo much ſtronger than any thing we can make with hemp, that they will not bear a compariſon.—From the ſame plant, by another preparation, they draw long ſlender fibres, which ſhine like ſilk, and are as white as ſnow: of theſe, which are very ſtrong, they make their fineſt clothes; and of the leaves, without any other preparation than ſplitting them into proper breadths, and tying the ſtrips together, they make their fiſhing-nets, ſome of which are of an enormous ſize.

The ſeeds of this valuable plant were brought over into England; but, upon the firſt trial, appeared to have loſt their vegetating power. We underſtand however that it has ſince ſucceeded with the aid of artificial heat.

The filamentous parts of different vegetables have been employed in different countries for the ſame mechanic uſes as hemp and flax among us. Putrefaction, and in ſome degree alkaline lixivia, deſtroy the pulpy or fleſhy matter, and leave the tough filaments entire. By curiouſly putrefying the leaf of a plant in water, we obtain the fine flexible fibres which conſtituted the baſis of the ribs and minute veins, and which form as it were a ſkeleton of the leaf. In Madagaſcar, different kinds of cloth are prepared from the filaments of the bark of certain trees boiled in ſtrong ley; and ſome of theſe cloths are very fine, and approach to the ſoftneſs of ſilk, but in durability come ſhort of cotton: others are coarſer and ſtronger, and laſt thrice as long as cotton; and of theſe filaments they make ſails and cordage to their veſſels. The ſtalks of nettles are ſometimes uſed for like purpoſes, even in France; and Sir Hans Sloane relates, in one of his letters to Mr Ray, that he has been informed by ſeveral, that muſlin and callico, and moſt of the Indian linens, are made of nettles. A ſtrong kind of cloth is ſaid to be prepared in ſome of the provinces of Sweden of hop-ſtalks; and in the Tranſactions of the Swediſh Academy for 1750, we have an account of an experiment relating to this ſubject: A quantity of ſtalks was gathered in autumn, which was equal in bulk to a quantity of flax ſufficient to yield a pound after preparation. The ſtalks were put into water, and kept covered with it during the winter. In March, they were taken out, dried in a ſtove, and dreſſed as flax. The prepared filaments weighed nearly a pound, and proved fine, ſoft, and white; they were ſpun and wove into ſix ells of fine ſtrong cloth. Unleſs the ſtalks are fully rotted, which will take much longer time than flax, the woody part will not ſeparate, and the cloth will prove neither white nor fine.

PHOSPHATE is a ſaline body compoſed of phoſphoric acid united to ſome baſe, as for inſtance, lime, which is called phoſphate of lime. For an account of the different phoſphates, ſee CHEMISTRY and MINERALOGY *Index*.

PHOSPHORUS, a name given to certain ſubſtances which ſhine in the dark without emitting heat. By this circumſtance they are diſtinguiſhed from the *pyrophori*, which though they take fire on being expoſed to the air, are yet entirely deſtitute of light before this expoſure.

Phoſphori are divided into ſeveral kinds, known by the names of *Bolognian phoſphorus*, *Mr Canton's phoſphorus*, *Baldwin's phoſphorus*, *phoſphorus of urine*, &c. of which the laſt is by far the moſt remarkable both with reſpect to the quantity of light which it emits, and its property of taking fire and burning very fiercely upon being ſlightly heated or rubbed. For the method of preparing theſe, and for an account of their properties and combinations, ſee CHEMISTRY *Index*.

PHOTINIANS, in eccleſiaſtical hiſtory, were a ſect of heretics in the fourth century who denied the divinity of our Lord. They derive their name from *Photinus* their founder, who was biſhop of Sirmium, and a diſciple of Marcellus. Photinus publiſhed in the year 343 his notions reſpecting the Deity, which were repugnant both to the orthodox and Arian ſyſtems. He aſſerted, that Jeſus Chriſt was born of the Holy Ghoſt and the Virgin Mary: that a certain divine emanation, which he called the *Word*, deſcended upon Him; and that becauſe of the union of the divine word with his human nature, He was called the ſon of God and even God himſelf; and that the Holy Ghoſt was not a perſon, but merely a celeſtial virtue proceeding from the Deity. Both parties condemned the biſhop in the councils of Antioch and Milan, held in the years 345 and 347. He was condemned alſo by the council at Sirmium in 351, and was afterwards degraded from the epiſcopal dignity, and at laſt died in exile in the year 372 or 375. His opinions were afterwards revived by Socinus.

PHOTIUS, patriarch of Conſtantinople, was one of the fineſt geniuſes of his time, and his merit raiſed him to the patriarchate; for Bardas having driven Ignatius from the ſee, Photius was conſecrated by Aſbeſtus in 859. He condemned Ignatius in a ſynod, whereupon the pope excommunicated him, and he, to balance the account, anathematized the pope. Baſilius of Macedon, the emperor whom Photius had reproved for the murder of Michael the late emperor, expelled him, and reſtored Ignatius; but afterwards re-eſtabliſhed Photius, upon Ignatius's death, in 878. At laſt, being wrongfully accuſed of a conſpiracy againſt the perſon of Leo the philoſopher, ſon and ſucceſſor to Baſilius, he was expelled by him in 886, and is ſuppoſed to have died ſoon after. He wrote a *Bibliotheca*, which contains an examen of 280 authors: we have alſo 253 epiſtles of his; the *Nomacanon* under 14 titles; an abridgement of the acts of ſeveral councils, &c. This great man was born in Conſtantinople, and was deſcended from a very illuſtrious and noble family. His natural abilities were very great, and he cultivated them with the greateſt aſſiduity

fiduity. There was no branch of literature, whether facred and profane, and fcarcely any art or fcience, in which he was not deeply verfed. Indeed he appears to have been by far the greateft man of the age in which he lived; and was fo intimately concerned in the chief tranfactions of it, that ecclefiaftical writers have on that account called it *Seculum Photianum*. He was firft raifed to the chief dignities of the empire, being made principal fecretary of ftate, captain of the guards, and a fenator. In all thefe ftations he acquitted himfelf with a diftinction fuitable to his great abilities for he was a refined ftatefman, as well as a profound fcholar. His rife to the patriarchate was very quick; for when he was chofen to that office he was only a layman; but that he might be as it were gradually raifed to that dignity, he was made monk the firft day, reader the next, and the following days fub-deacon, deacon, and prieft. So that in the fpace of fix days he attained to the higheft office in the church. On the whole, however, his ardent love of glory and unbounded ambition made him commit exceffes which rendered him a fcourge to thofe about him.

Fabricius calls his *Bibliotheca* or library, *non liber, fed infignis thefaurus*, "not a book, but an illuftrious treafure," in which are contained many curious things, relating to authors, and many fragments of works which are no where elfe to be found. It was brought to light by Andreas Schottus, and communicated by him to David Hoefchelius, who caufed it to be printed in 1601. Schottus, confidering the great utility of this work, tranflated it into Latin, and printed his tranflation alone in 1606. The Greek text, together with the tranflation, was afterwards printed at Geneva in 1611.

PHOTOMETER, an inftrument for afcertaining the intenfity of light. See OPTICS *Index*.

PHRAATES, or PHRAHATES. There were four kings of this name in Parthia. See PARTHIA.

PHRASE, in *Grammar*, an elegant turn or manner of fpeech, peculiarly belonging to this or that occafion, this or that art, or this or that language. Thus we fay, an Italian *phrafe*, an eaftern *phrafe*, a poetical *phrafe*, a rhetorical *phrafe*.

PHRASE is fometimes alfo ufed for a fhort fentence or fmall fet or circuit of words conftructed together. In this fenfe, Father Buffier divides phrafes into complete and incomplete.

Phrafes are *complete* where there is a noun and a verb, each in its proper function; i. e. where the noun expreffes a fubject, and the verb the thing affirmed of it.

Incomplete phrafes are thofe where the noun and the verb together only do the office of a noun; confifting of feveral words without affirming any thing, and which might be expreffed in a fingle word. Thus, *that which is true*, is an incomplete phrafe, which might be expreffed in one word, *truth*; as, *that which is true fatiffies the mind*, i. e. *truth fatisfies the mind*.

PHRASEOLOGY, a collection of the phrafes or elegant expreffions in any language. See PHRASE.

PHREATIS, or PHREATTIUM, in Grecian antiquity, was a court belonging to the civil government of Athens, fituated upon the fea fhore, in the Piræus. The name is derived from απο τε φρεάτος, becaufe it ftood in a *pit*; or, as others fuppofe, from the hero *Phreatus*. This court heard fuch caufes as concerned perfons who had fled out of their own country for murder, or thofe that fled for involuntary murder, and who had afterwards committed a deliberate and wilful murder. The firft who was tried in this place was Teucer, on a groundlefs fufpicion that he had been acceffory to the death of Ajax. The accufed was not allowed to come to land, or fo much as to caft anchor, but pleaded his caufe in his bark; and if found guilty, was committed to the mercy of the winds and waves, or, as fome fome fay, fuffered there condign punifhment; if innocent, he was only cleared of the fecond fact, and, according to cuftom, underwent a twelvemonth's banifhment for the former. See Potter's *Gr. Antiq.* vol. i. p. 111.

PHRENITIC, a term ufed to denote thofe who, without being abfolutely mad, are fubject to fuch ftrong fallies of imagination as in fome meafure pervert their judgment, and caufe them to act in a way different from the more rational part of mankind.

PHRENITIS, the fame with PHRENSY; an inflammation of the meninges of the brain, attended with an acute fever and delirium. See MEDICINE, N° 176; alfo an account of a ftrange degree of phrenfy which attacked Charles VI. of France, in the article FRANCE, N° 88, 90.

PHRYGANEA, a genus of infects, belonging to the order neuroptera. See ENTOMOLOGY *Index*.

PHRYGIA, a country in Afia. From whence it derived its name is not certain: fome fay it was from the river Phryx (now Sarabat), which divides Phrygia from Caria, and empties itfelf into the Hermus; others from Phrygia, the daughter of Afopus and Europa. The Greek writers tell us, that the country took its name from the inhabitants, and thefe from the town of Brygium in Macedonia, from whence they firft paffed into Afia, and gave the name of *Phrygia* or *Brygia* to the country where they fettled. Bochart is of opinion that this tract was called Phrygia from the Greek verb φρυγειν, "to burn or parch;" which, according to him, is a tranflation of its Hebrew name, derived from a verb of the fame fignification.

Ancient Univerfal Hiftory, vol. iii. p. 441, &c.

No lefs various are the opinions of authors as to the exact boundaries of this country; an uncertainty which gave rife to an obfervation made by Strabo, viz. that the Phrygians and Myfians had diftinct boundaries; but that it was fcarce poffible to afcertain them. The fame writer adds, that the Trojans, Myfians, and Lydians, are, by the poets, all blended under the common name of Phrygians, which Claudian extends to the Pifidians, Bithynians, and Ionians. Phrygia Proper, according to Ptolemy, whom we choofe to follow, was bounded on the north by Pontus and Bithynia; on the weft by Myfia, Troas, the Ægean fea, Lydia, Mæonia, and Caria; on the fouth by Lycia; on the eaft by Pamphylia and Galatia. It lies between the 37th and 41ft degrees of north latitude, extending in longitude from 56 to 62 degrees. The inhabitants of this country, mentioned by Ptolemy, are the Lycaones and Anthemifenii, towards Lycia; and Moccadelis or Moccadine, the Cyddefes or Cydiffes towards Bithynia; and between thefe the Peltini or Speltini, the Moxiani, Phylacenfes, and Hierapolitæ. To thefe we may add the Berecyntes mentioned by Strabo.

Phrygia is commonly divided into the Greater and Leffer Phrygia, called alfo Troas. But this divifion did not take place till Troas was fubdued by the Phrygians; and hence it is more confidered by fome Roman writers as a part of Phrygia, than Bithynia, Cappadocia,

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cia, or any other of the adjacent provinces. In after ages, the Greater Phrygia was divided into two diſtricts or governments; one called Phrygia Pacatiana, from Pacatianus, who, under Conſtantine, bore the great office of the præfectus prætorio of the Eaſt; the other Phrygia Salutaris, from ſome miraculous cures ſuppoſed to have been performed there by the archangel Michael.

This country, and indeed all Aſia Minor, as lying in the fifth and ſixth northern climates, was in ancient times greatly celebrated for its fertility. It abounded in all ſorts of grain; being, for the moſt part, a plain country covered with a deep rich ſoil, and plentifully watered by ſmall rivers. It was in ſome parts productive of bitumen and other combuſtible ſubſtances. It was well ſtocked with cattle, having large plains and paſture grounds. The air was anciently deemed moſt pure and wholeſome, though it is now in ſome parts thought extremely groſs, great part of the country lying uncultivated.

In Phrygia Major were anciently ſeveral cities of great celebrity; ſuch as APANEA, LAODICEA, HIERAPOLIS, Gordium, &c.—There were alſo ſome famous rivers; ſuch as Marſyas, Mæander, &c. The Mæander is now called *Madre* or *Mindre*, and was much celebrated by the ancients for its windings and turnings; from whence all ſuch windings and turnings have been denominated *mæanders*.

The Phrygians accounted themſelves the moſt ancient people in the world. Their origin, however, is extremely dark and uncertain. Joſephus and St Jerome ſay, they were deſcended from Togarmah, one of Gomer's ſons: and that they were known to the Hebrews under the name of Tigrammanes. The Heathen authors derive them from the Brygians, a people of Macedonia. But this is but mere conjecture; and it is a conjecture totally unſupported, except by the ſimilarity of names. Bochart thinks that the Phrygians were the offspring of Gomer the eldeſt ſon of Japhet: the word Phrygia being the Greek tranſlation of his name. Joſephus makes Gomer the father of the Galatians; but he, by the Galatians, muſt neceſſarily mean the Phrygians inhabiting that part of Phrygia which the Galatians had made themſelves maſters of; the deſcendants of Gomer being placed by Ezekiel northward of Judæa, near Togarmah (which Bochart takes to be Cappadocia), long before the Gauls paſſed over into Aſia. We are willing to let Gomer enjoy the fine country which Bochart is pleaſed to give him, and allow him the honour of being the progenitor of the Phrygians, ſince we know no other perſon on whom it can be conferred with any degree of probability.

The ancient Phrygians are deſcribed as ſuperſtitious, voluptuous, and effeminate, without any prudence or foreſight, and of ſuch a ſervile temper, that nothing but ſtripes and ill uſage could make them comply with their duty; which gave riſe to ſeveral trite and well known proverbs (A). They are ſaid to have been the firſt inventors of divination by the ſinging, flying, and feeding of birds. Their muſic, commonly called the *Phrygian mood*, is alleged by ſome as an argument of their effeminacy.

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This government was certainly monarchical; for all Phrygia was, during the reigns of ſome kings, ſubject to one prince. Ninnacus, Midas, Manis, Gordius, and his deſcendants, were undoubtedly ſovereigns of all Phrygia. But ſome time before the Trojan war, we find this country divided into ſeveral petty kingdoms, and read of divers princes reigning at the ſame time. Apollodorus mentions a king of Phrygia contemporary with Ilus king of Troy. Cedrenus and others ſpeak of one Teuthrans, king of a ſmall country in Phrygia, whoſe territories were ravaged by Ajax, himſelf ſlain in ſingle combat, his royal ſeat laid in aſhes, and his daughter, by name Tecmeſſa, carried away captive by the conqueror. Homer makes mention of Phoreys and Aſcanius, both princes and leaders of the Phrygian auxiliaries that came to the relief of Troy. Tantalus was king of Sipylus only, and its diſtrict; a prince no leſs famous for his great wealth, than infamous for his covetouſneſs and other deteſtable vices. That Phrygia was ſubdued either by Ninus, as Diodorus Siculus informs us, or by the Amazons, as we read in Suidas, is not ſufficiently warranted. Moſt authors that ſpeak of Gordius tell us, that the Phrygians having ſent to conſult an oracle in order to know how they might put an end to the inteſtine broils which rent their country into many factions and parties, received for anſwer, that the moſt effectual means to deliver themſelves and their country from the calamities they groaned under, was to commit the government to a king. This advice they followed accordingly, and placed Gordius on the throne.

Apamea was the chief emporium of all Aſia Minor.—Thither reſorted merchants and traders from all parts of Greece, Italy, and the neighbouring iſlands. Beſides, we know from Syncellus, that the Phrygians were for ſome time maſters of the ſea; and none but trading nations ever prevailed on that element. The country produced many choice and uſeful commodities, which afforded conſiderable exports. They had a ſafe coaſt, convenient harbours, and whatever may incline us to think that they carried on a conſiderable trade. But as moſt of the Phrygian records are loſt, we will not dwell on conjectures ſo difficult to be aſcertained.

We have no ſet form of their laws; and as to their learning, ſince we are told that for ſome time they enjoyed the ſovereignty of the ſea, we may at leaſt allow them a competent ſkill in geography, geometry, and aſtronomy; and add to theſe, from what we have ſaid above, a more than ordinary knowledge of muſic.

Some have been of opinion that the Phrygian language bore a great reſemblance to the Greek; but the

(A) "Phryges ſero ſapiunt, Phryx verberatus melior, Phryx non minus quam Spyntharus, &c.:" which proverbs intimate their ſervile temper; and ſhow that they were more fit to bewail misfortunes in an unmanly manner, than to prevent them by proper meaſures. Their muſic, too, was ſuited to their effeminate temper. The Doric mood was a kind of grave and ſolid muſic; the Lydian a doleful and lamentable harmony; but the Phrygian chiefly calculated to effeminate and enervate the mind. But this character is contradicted by others.

the contrary is manifeſt from the few Phrygian words which have been tranſmitted to us, and carefully collected by Bochart and Rudbechius. To theſe we may add the authority of Strabo, who, after attempting to derive the name of a Phrygian city from the Greek, concludes, that it is a difficult matter to diſcover any ſimilitude between the barbarous words of the Phrygian language and the Greek. The Phrygian tongue, after the experiment made by Pſammetichus king of Egypt, was looked upon by the Egyptians as the moſt ancient language of the world. But other nations, particularly the Scythians, refuſed to ſubmit to their opinion, as founded on an argument of no real weight. "As the two children (ſay they) had never heard the voice of any human creature, the word *bec*, or *bekkos*, the firſt they uttered, was only an imitation of the goats that had ſuckled them, and happened to be a Phrygian word ſignifying *bread* (B).

We have already ſaid, that the Phrygians were ſuperſtitious; their idols were conſequently very numerous. The chief of theſe was Cybele, who went by a variety of names. (See CYBELE). They alſo worſhipped Bacchus under the name of *Sabazios*; and his prieſts they called *Saboi*.

The hiſtory of their kings is dark and uncertain, and the dates of their ſeveral reigns and actions cannot now be fixed; we ſhall refer ſuch of our readers, therefore, as wiſh to know what is certain reſpecting them, to the Ancient Univerſal Hiſtory, already quoted more than once in the preſent article. See alſo GORDIUS, MIDAS, &c. For Phrygia Minor, ſee TROY.

PHRYGIAN STONE, in *Natural Hiſtory*, is the name of a ſtone deſcribed by the ancients, and uſed by them in dyeing; perhaps from ſome vitriolic or aluminous ſalt contained in it, which ſerved to enliven or fix the colours uſed by the dyers. It was light and ſpungy, reſembling a pumice; and the whiteſt and lighteſt were reckoned the beſt. Pliny gives an account of the method of preparing it for the purpoſe of dyeing, which was by moiſtening it with urine, and then heating it red hot, and ſuffering it to cool.—This calcination was repeated three times, and the ſtone was then fit for uſe. Dioſcorides recommended it in medicine after burning; he ſays it was drying and aſtringent.

PHRYGIANS, a Chriſtian ſect. See CATAPHRYGIANS and MONTANISTS.

PHRYNE, was a famous proſtitute, who flouriſhed at Athens about 328 years before the Chriſtian era. She was miſtreſs of Praxiteles, who drew her picture, which was one of his beſt pieces, and was placed in the temple of Apollo at Delphi. We are told that Apelles painted his Venus Anadyomene after he had ſeen Phryne on the ſea-ſhore naked, and with diſhevelled hair. Phryne became ſo very rich by the liberality of her lovers, that ſhe offered to rebuild Thebes at her own expence, which Alexander had deſtroyed, provided this inſcription was placed on the walls: *Alexander diruit, ſed meretrix Phryne refecit*; which was refuſed. See *Plin.* 34. c. 8.——There was another of the ſame name who was accuſed of impiety. When ſhe found that ſhe was going to be condemned, ſhe unveiled her boſom, which ſo influenced her judges, that ſhe was immediately acquitted.

PHRYNICUS, a general of Samos, who endeavoured to betray his country, &c.——A flatterer at Athens. ——A tragic poet of Athens, diſciple to Theſpis. He was the firſt who introduced a female character on the ſtage.

PHRYNIS was a muſician of Mitylene. He was the firſt who obtained a muſical prize at the Panathenæa at Athens. He added two ſtrings to the lyre, which had always been uſed with ſeven by all his predeceſſors. He flouriſhed about 438 years before the Chriſtian era. We are told that he was originally a cook at the houſe of Hiero king of Sicily.——There was another of the ſame name, a writer in the reign of Commodus, who made a collection, in 36 books, of phraſes and ſentences from the beſt Greek authors, &c.

PHRYXUS, in fabulous hiſtory, was a ſon of Athamas king of Thebes, by Nephele. When his mother was repudiated, he was perſecuted with the moſt inveterate fury by his ſtep-mother Ino, becauſe he was to ſit on the throne of Athamas, in preference to the children of a ſecond wife. His mother apprized him of Ino's intentions upon his life; or, according to others, his preceptor; and the better to make his eſcape, he ſecured part of his father's treaſures, and privately left Bœotia with his ſiſter Helle, to go to their friend and relation Æetes king of Colchis. They embarked on board a ſhip, or, as we are informed by the fabulous account of the poets and mythologiſts, they mounted on the back of a ram, whoſe fleece was of gold; and proceeded on their journey through the air. The height to which they were carried made Helle giddy, and ſhe fell into the ſea. Phryxus gave his ſiſter a decent burial on the ſea-ſhore, and after he had called the place *Helleſpont* from her name, he continued his flight, and arrived ſafe in the kingdom of Æetes, where he offered the ram on the altar of Mars. The king received him with great tenderneſs, and gave him Chalciope his daughter in marriage. She had by him Phrontis Melas, Argos Cylindrus, whom ſome call *Cytorus*. He was afterwards murdered by his father-in-law, who envied him the poſſeſſion of the golden fleece; and Chalciope, to prevent her children from ſharing their father's fate, ſent them privately from Colchis to Bœotia, as nothing was to be dreaded there from the jealouſy or reſentment of Ino, who was then dead. The fable of the flight of Phryxus to Colchis on a ram has been explained by ſome, who obſerve, that the ſhip on which he embarked was either called by that name, or carried on her prow a figure of that animal. The fleece of gold is accounted for, by obſerving that Phryxus carried away immenſe treaſures from Thebes. Phryxus was placed among the conſtellations of heaven after death. The ram which carried him to Aſia is ſaid to have been the fruit of Neptune's amour with Theophane the daughter of Altis. This ram the gods had given to Athamas in order to reward his piety and religious life; and Nephele procured it for her

(B) Goropius Becanus makes uſe of the ſame argment, to prove that the High Dutch is the original or mother-tongue of the world, becauſe the word *beker* in that language ſignifies "a baker."

her children, just as they were going to be sacrificed to the jealousy of Ino. Phryxus's murder was some time after amply revenged by the Greeks; it having occasioned the famous expedition atchieved under Jason and many of the princes of Greece, which had for its object the recovery of the golden fleece, and the punishment of the king of Colchis for his cruelty to the son of Athamas.

PHTHIRIASIS, the LOUSY EVIL, from φθειρ, "a louse." Children are frequently its subjects, but adults are sometimes troubled with it. The increase of lice, when in a warm moist situation, is very great; but a cold and dry one soon destroys them. On the human body four kinds of lice are distinguished: 1. The *pediculi*, so called because they are more troublesome with their feet than by their bite. These are in the heads of children, especially if sore or scabby; and often in those of adults, if they are slothful and nasty. 2. Crab-lice. 3. Body lice; these infest the body, and breed in the clothes of the nasty and slothful. 4. A sort which breed under the cuticle, and are found in the hands and feet: they are of a round form, and so minute as often to escape the sight: by creeping under the scarf skin they cause an intolerable itching; and when the skin bursts where they lodge, clusters of them are found there. See ACARUS.

A good diet and cleanliness conduce much to the destruction of lice. When they are in the head, comb it every day; and, after each combing, sprinkle the pulv. sem. staph. agr. or coccul. Ind. among the hairs every night, and confine it with a tight cap.

Codrochius, in his treatise on lice, says, that the powdered coc. Ind. exceeds all other means; and that it may be mixed in the pulp of apple, or in lard, and applied every night to the hair. Some writers assert, that if the pulv. cort. rad. sassafr. be sprinkled on the head, and confined with a handkerchief, it destroys the lice in one night.

The body-lice are destroyed by any bitter, sour, salt, or mercurial medicine, if applied to the skin.

Black soap, and the flowers called *cardamine* or *lady's smock*, are said to be specifics in all cases of lice on the human body.

PHTHISIS, a species of consumption, occasioned by an ulcer in the lungs. See MEDICINE *Index*.

PHUL, or PUL, king of Assyria, is by some historians said to be Ninus under another name, and the first founder of that monarchy: A renowned warrior. He invaded Israel in the reign of Menahem, who became tributary to him, and paid him 1000 talents of silver for a peace. Flourished 771 B. C.

PHUT, or PHUTH, the third son of Ham (Gen. x. 6.). Calmet is of opinion, that Phut peopled either the canton of Phtemphu, Phtemphuti, or Phtembuti, set down in Pliny and Ptolemy, whose capital was Thara in Lower Egypt, inclining towards Libya; or the canton called Phtenotes, of which Buthus was the capital. The prophets often speak of Phut. In the time of Jeremiah, Phut was under the obedience of Necho king of Egypt. Nahum (iii. 9.) reckons up his people in the number of those who ought to have come to the assistance of No-ammon or Diospolis.

PHYLACTERY, in the general, was a name given by the ancients to all kinds of charms, spells, or characters, which they wore about them, as amulets, to preserve them from dangers or diseases.

PHYLACTERY particularly denoted a slip of parchment, wherein was written some text of Holy Scripture, particularly of the decalogue, which the more devout people among the Jews wore on the forehead, the breast, or the neck, as a mark of their religion.

The primitive Christians also gave the name *phylacteries* to the cases wherein they inclosed the relicks of their dead.

Phylacteries are often mentioned in the New Testament, and appear to have been very common among the Pharisees in our Lord's time.

PHYLICA, BASTARD ALATERNUS; a genus of plants belonging to the pentandria class. See BOTANY *Index*.

PHYLLANTHUS, SEA-SIDE LAUREL; a genus of plants belonging to the monœcia class. See BOTANY *Index*.

PHYLLIS, in fabulous history, was a daughter of Sithon, or, according to others, of Lycurgus king of Thrace, who received Demophoon the son of Theseus; who, at his return from the Trojan war, had stopped on her coasts. She became enamoured of him, and did not find him insensible to her passion. After some months of mutual tenderness and affection, Demophoon set sail for Athens, where his domestic affairs recalled him. He promised faithfully to return as soon as a month was expired; but either his dislike for Phyllis, or the irreparable situation of his affairs, obliged him to violate his engagement: and the queen, grown desperate on account of his absence, hanged herself, or, according to others, threw herself down a precipice into the sea and perished. Her friends raised a tomb over her body, where there grew up certain trees, whose leaves, at a particular season of the year, suddenly became wet as if shedding tears for the death of Phyllis. According to an old tradition mentioned by Servius, Virgil's commentator, Phyllis was changed by the gods into an almond tree, which is called *phylla* by the Greeks. Some days after this metamorphosis, Demophoon revisited Thrace; and when he heard of the fate of Phyllis, he ran and clasped the tree, which, though at that time stripped of its leaves, suddenly shot forth, and blossomed as if still sensible of tenderness and love. The absence of Demophoon from the house of Phyllis has given rise to a beautiful epistle of Ovid, supposed to have been written by the Thracian queen about the fourth month after her lover's departure.—A country woman introduced in Virgil's eclogues.—The nurse of the emperor Domitian.—A country of Thrace near Mount Pangæus.

PHYSALIS, the WINTER CHERRY; a genus of plants belonging the pentandria class. See BOTANY *Index*.

PHYSETER, or SPERMACETI WHALE, a genus belonging to the order of cete. See CETOLOGY *Index*.

PHYSIC, or PHYSICK, the art of healing; properly called MEDICINE. The word is formed from the Greek φυσις, "nature;" in regard medicine consists principally in the observation of nature. See PHYSICS and MEDICINE.

PHYSICAL, something belonging to, or really existing

Phyfical, Phyfician. exifting in, nature. In this fenfe we fay a phyfical point, in oppofition to a mathematical one, which only exifts in the imagination; a phyfical fubftance or body, in oppofition to fpirit, or metaphyfical fubftance, &c.

PHYSICIAN, a perfon who profeffes medicine, or the art of healing difeafes. See MEDICINE.

PHYSICIANS, College of, in London, Edinburgh, and Dublin. See *COLLEGE of Phyficians.* Phyficians, Phyfico-mathematics.

PHYSICO-MATHEMATICS, includes thofe branches of phyfics which, uniting obfervation and experiment to mathematical calculation, undertake to explain the phenomena of nature.

PHYSICS,

1 General definition of phyfics.

TAKEN in its moft enlarged fenfe, comprehends the whole ftudy of nature; and NATURAL PHILOSOPHY is a term of the fame extent: but ordinary language, and efpecially in this country, employs both of thefe terms in a much narrower fenfe, which it is proper in this place to determine with fome precifion.

2 A more particular explanation of the term.

Under the article PHILOSOPHY, we gave a particular account of that view of nature in which the objects of our attention are confidered as connected by caufation; and we were at fome pains to point out the manner in which this ftudy may be fuccefsfully cultivated. By a judicious employment of the means pointed out in that article, we difcover that the objects of our contemplation compofe an UNIVERSE, which confifts, not of a number of independent exiftences folitary and detached from each other, but of a number of fubftances connected by a variety of relations and dependencies, fo as to form a whole which may with great propriety be called the SYSTEM OF NATURE.

This affembling of the individual objects which compofe the univerfe into one fyftem is by no means the work of a hafty and warm fancy, but is the refult of fober contemplation. The natural hiftorian attempts in vain to defcribe objects, by only informing us of their fhape, colour, and other fenfible qualities. He finds himfelf obliged, in defcribing a piece of marble, for inftance, to tell us that it takes a fine polifh; that it ftrikes fire with fteel; that it burns to quicklime; that it diffolves in aquafortis, and is precipitated by alkalies; that with vitriolic acid it makes gypfum, &c. &c. &c. and thus it appears that even the *defcription* of any thing, with the view of afcertaining its fpecific nature, and with the fole purpofe of difcrimination, cannot be accomplifhed without taking notice of its various relations to other things. But what do we mean by the *nature* of any thing? We are ignorant of its effence, or what makes it that thing and no other thing. We muft content ourfelves with the difcovery of its *qualities* or *properties*; and it is the affemblage of thefe which we call its *nature*. But this is very inaccurate. Thefe do not conftitute its effence, but are the confequences of it. Yet this is all we fhall ever know of its nature. Now the term *property* is nothing but a name expreffing fome relation which the fubftance under confideration has to other things. This is true of all fuch terms. Gravity, elafticity, fenfibility, gratitude, and the like, exprefs nothing but certain *matters of fact*, which may be obferved refpecting the object of our contemplation in different circumftances of fituation with regard to other things. Our diftinct notions of individuals, therefore, imply their relations to other things.

3 All parts of the univerfe evidently connected in their various properties.

The flighteft obfervation of the univerfe fhows an evident connection between all its parts in their various properties. All things on this earth are connected with each other by the laws of motion and of mind. We are connected with the whole of the folar fyftem by gravitation. If we extend our obfervations to the fixed ftars, the connection feems to fail; but even here it may be obferved. Their inconceivable diftance, it is true, renders it impoffible for us to obtain any *extenfive* information as to their nature. But thefe bodies are connected with the folar fyftem by the famenefs of the light which they emit with that emitted by our fun or any fhining body. It moves with the fame velocity, it confifts (in moft of them at leaft) of the fame colours, and it is reflected, refracted, and inflected, according to the fame laws.

4 Our attention naturally directed in the firft inftance to our fellow men.

In this unbounded fcene of contemplation, our attention will be directed to the different claffes of objects nearly in proportion to the intereft we take in them. There is nothing in which we are fo much interefted as our fellow men; and one of the firft fteps that we make in our knowledge of nature, is an acquaintance with them. We learn their *diftinctive* nature by attending to their *characteriftic* appearances; that is, by obferving their actions. We obferve them continually producing, like ourfelves, certain changes in the fituation or condition of furrounding objects; and thefe changes are evidently directed to certain ends *which refpect themfelves*. Obferving this fubferviency of the effects which they produce to their own accommodation, we confider this adjuftment of means to ends as the effect of an INTENTION, as we experience it to be in our own cafe, where we are confcious of this intention, and of thefe its effects. We therefore interpret thofe actions of other men, where we obferve this adjuftment of means to ends, as marks or figns of intention in them fimilar to our own. And thus a quality, or power, or faculty, is *fuppofed* in them *by means of its fign*, although the quality itfelf is not *immediately* cognifable by our fenfes. And as this intention in ourfelves is accompanied by perception of external objects, knowledge of their properties, defire of good, averfion from evil, volition, and exertion, without all of which we could not or would not perform the actions which we daily perform, we *fuppofe* the fame perception, knowledge, defire, averfion, volition, and exertion in them.

5 Nature of intention.

Thus, by the conftitution of our mind, we confider the employment of means, by which ends terminating in the agent are gained, as the natural figns of defign or intention. ART, therefore, or the employment of means, is the natural fign of intention; and wherever we obferve this adjuftment of means to ends, we infer the agency of defign.

A fmall acquaintance with the objects around us, obliges us to extend this inference to a great number of beings befides our fellow men, namely, to the whole animal

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animal creation: for in all we obſerve the ſame ſubſerviency to the ends of the agent, in the changes which we find them continually producing in the objects around them. Theſe changes are all adjuſted to their own well-being. In all ſuch caſes, therefore, we are forced, by the conſtitution of our own minds, to infer the exiſtence of deſign or intention in theſe beings alſo.

But in numberleſs changes produced by external objects on each other, we obſerve no ſuch fitneſs in the effects, no ſuch ſubſerviency to the well-being of the agent. In ſuch caſes, therefore, we make no ſuch inference of thought or deſign.

6
All objects divided into thinking and unthinking beings.

Thus, then, there is preſented to our obſervation an important diſtinction, by which we arrange all external objects into two claſſes. The firſt reſembles ourſelves, in giving external marks of that thought or intention of which we are conſcious; and we *ſuppoſe* in them the other properties which we diſcover in ourſelves, but cannot *immediately* obſerve in them, viz. thought, perception, memory, foreſight, and all that collection of faculties which we feel in ourſelves, and which conſtitute the animal. The other claſs of objects exhibits no ſuch appearances, and we make no ſuch inference. And thus we divide the whole of external nature into the claſſes of THINKING and UNTHINKING beings.

7
How we come to the knowledge of mind.

Our firſt judgments about theſe claſſes will be very inaccurate; and we will naturally aſcribe the differences, which we do not very well underſtand, to the differences in organical ſtructure, which we clearly obſerve. But when we have knocked down or perhaps ſmothered an animal, we find that it no longer gives the former mark of thought and intention, and that it now reſembles the claſs of unthinking beings: And yet it ſtill retains all that fitneſs of organical ſtructure which it had before; it ſeems only to want the intention and the will. This obliges us to conclude that the diſtinction does not ariſe from a difference in organical ſtructure, but from a diſtinct ſubſtance common to all thinking beings, but ſeparable from their organical frame. To this ſubſtance we aſcribe thought, intention, contrivance, and all that collection of faculties which we feel in ourſelves. To this ſubſtance in ourſelves we refer all ſenſations, pleaſures, pains, remembrances, deſires, purpoſes; and to this aggregate, however imperfectly underſtood, we give the name MIND. Our organical frame, which ſeems to be only the inſtrument of information and operation to the mind, we call *our* body.

8
The nature of mind as underſtood by mankind in rude ages.

As the animating principle is not, like our body, the immediate object of the ſenſes, we naturally conceive it to be a ſubſtance eſſentially different from thoſe which are the objects of our ſenſes. The rudeſt people have ſhown a diſpoſition to form this concluſion. Obſerving that animal life was connected with breathing, it was natural to imagine that breathing was living, and that breath was life. It is a remarkable fact, that in moſt languages the term for expreſſing *breath* is at leaſt one of the terms for expreſſing the ſoul; רוח, πνευμα, *ſpiritus*, in the Hebrew, Greek, and Latin, expreſs both; *gheiſt*, or *ghoſt*, in the Teutonic, comes from *gheiſen*, to "breath or ſigh;" *dūcha* or *dūha*, "the ſoul," in Sclavonic, comes from *duichat*, "to breathe;" ſo in the Gaelic does *anal* come from *anam*; and the ſame relation is found between the two words in the Malay and other eaſtern languages. We believe that moſt perſons can recollect ſome traces of this notion in their early conceptions of things; and many who do not conſider themſelves as uncultivated, believe that the ſoul quits the body *along with the laſt breath*. Among the Tartar nations hanging is conſidered with particular horror, on account of the ungraceful and filthy exit which the ſoul is obliged to make from the body.

9
Their opinion not juſt.

But the obſervation of the ſame appearances of thought and intention in fiſhes and other animals which do not breathe, would ſoon ſhow that this was but a rude conception. Very little refinement indeed is neceſſary to convince us that air or breath cannot be the ſubſtance which thinks, wiſhes, and deſigns; and that the properties of this ſubſtance, whatever it is, muſt be totally different from, and incompatible with, any thing that we know of the immediate objects of our ſenſes.

10
Of the two kinds of ſubſtances in nature, one is the object of reflection alone, the other of the ſenſes.

Hence we are led to conclude that there are two kinds of ſubſtances in nature: One, which is the principle of ſenſation; and therefore *cannot* be the object of our ſenſes, any more than light can be the object of the microſcope. This ſubſtance alone can feel, think, deſire, and propoſe, and is the object of *reflection alone*. The objects of our ſenſes compoſe the other claſs, and therefore can have none of the other properties which are not cognoſcible by the ſenſes. Theſe have all the properties which our ſenſes can diſcover; and we can have no evidence of their having any other, nor indeed any conception of their having them. This claſs is not confined to the unorganized maſſes of matter; for we ſee that the bodies of animals loſe after death that organical form, and are aſſimilated to all the reſt of unthinking beings. It has ariſen from ſuch views as this, that while all nations have agreed to call this claſs of objects by the name BODY, which originally expreſſes our organical frame, ſome nations, farther advanced in cultivation or refinement, have contrived an abſtract term to expreſs this general ſubſtance of which all inanimate beings are compoſed. Such a term we have in the words *materies*, ὕλη.

11
The diſtinction between material and immaterial ſubſtances is very important.

Matter, then, is that ſubſtance which is immediately cognoſcible by our ſenſes. Whatever, therefore, is not thus immediately cognoſcible by our ſenſes is not material, and is expreſſed by a negative term, and called *immaterial*: hence it is that mind is ſaid to be immaterial. It is of importance to keep in mind this diſtinction, merely grammatical. Little more is neceſſary for detecting the ſophiſms of Helvetius, Mirabeau, and other ſages of the Gallic ſchool, who have been anxious to remove the ties of moral and religious obligation by lowering our conceptions of our intellectual nature. It will alſo ſerve to ſhow how haſtily *they* have formed their opinions who have aſcribed to the immediate agency of mind all thoſe relations which are obſerved in the actions of bodies on each other at a diſtance. The connecting principles of ſuch relations *à diſtance* (if there be any ſuch), are not the immediate objects of our ſenſes: they are therefore immaterial. But it does not follow that they are minds. There may be many immaterial ſubſtances which are not minds. We know nothing of any object whatever but by the obſervation of certain appearances, which ſuggeſt to our minds the exiſtence and agency of its qualities or powers. Such phenomena are the natural ſigns of theſe qualities, and it is to thoſe ſigns that we muſt always have recourſe when we wiſh to conceive

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conceive without ambiguity concerning them. What is the characteriſtic phenomenon of mind, or what is the *diſtinguiſhing* quality which brings it into view? It is INTENTION: and it may be aſſerted with the utmoſt confidence, that we have no other mark by which mind is immediately ſuggeſted to us, or that would ever have made us ſuppoſe that there exiſted another mind beſides our own. The *phenomenon* by which this quality is ſuggeſted to us is *art*, or the employment of means to gain ends; and the mark of art is the ſuppoſed conduciveneſs of theſe ends to the well-being of the agent. Where this train is not obſerved, deſign or intention is never thought of; and therefore where intention is not perceived in any immaterial ſubſtance, if any ſuch has ever been obſerved, it is an abuſe of language to call it mind. We do not think that even perception and intelligence entitle us to give the name mind to the ſubſtance in which they are inherent, becauſe it is from marks of intention alone that we infer the exiſtence of mind; and although theſe muſt be accompanied with perception and intelligence, it does not follow that the ſubſtance which can perceive and underſtand muſt alſo deſire and propoſe. However difficult we may find it to ſeparate them, they are evidently ſeparable in imagination. And let not this aſſertion be too haſtily objected to; for the ſeparation *has been made* by perſons moſt eminent for their knowledge and diſcernment. When Leibnitz aſcribed to his MONADES, or what we call the ultimate ATOMS of matter, a perception of their ſituation in the univerſe, and a motion preciſely ſuited to this perception, he was the fartheſt in the world from ſuppoſing them animated or endowed with minds. It is true indeed, that others, who think and call themſelves philoſophers, are much more liberal in their application of this term. A modern author of great metaphyſical eminence ſays, "I call that *mind* which moves, and that *body* which is moved." This claſs of philoſophers aſſert that no motion whatever is begun except by the agency of an animating principle, which (after Ariſtotle) they call *Nature*, and which has in theſe days been exalted to the rank of a god. All this jargon (for it is nothing elſe) has ariſen from the puzzle in which naturaliſts think themſelves involved in attempting to explain the production of motion in a body at a diſtance from that body which is conceived as the cauſe of this motion. After having been reluctantly obliged, by the reaſonings of Newton, to abandon their methods of explaining ſuch phenomena by the impulſes of an intervening fluid, nothing ſeemed left but the aſſertion that theſe motions were produced by minds, as in the caſe of our own exertions. Theſe explanations (if they deſerve the name) cannot be objected to in any other way than as an abuſe of language, and as the introduction of an unmeaning jargon. We have, and can have, no notion of mind different from thoſe of our own minds; and we diſcover the exiſtence of other minds as we diſcover the exiſtence of bodies, by means of phenomena which are characteriſtic of minds, that is, which reſemble thoſe phenomena that follow the exertion of our own mental faculties, that is, by the employment of means to attain ſelfiſh ends; and where ſuch appearances are not obſerved, no exiſtence of a mind is inferred. When we ſee a man fall from the top of a houſe, and daſh out his brains on the pavement, we never aſcribe this motion to his mind. Although the fitneſs of many of the celeſtial motions for moſt important purpoſes makes us ſuppoſe deſign and contrivance ſomewhere, and therefore a *Supreme Mind*, we no more think of inferring a mind in the earth from the fitneſs of its motions for purpoſes moſt beneficial to its inhabitants, than of inferring a mind in a bit of bread from its fitneſs for nouriſhing our bodies. It is not from the mere motions of animals that their minds are inferred, but from the conduciveneſs of theſe motions to the well-being of the animal.

12 The mind is not that which produces motion, but that which deſires and wills.

The term mind therefore, in the *ordinary language* of all men, is applied to what deſires and wills at the ſame time that it perceives and underſtands. If we call that mind which *produces motion*, we muſt derive our notions of its qualities or attributes from obſerving their effects. We muſt therefore diſcover the general laws by which they act, that is, the general laws obſerved in thoſe motions which we conſider as their effects. Now theſe are the general laws of motion; and in none of theſe can we find the leaſt coincidence with what we are accuſtomed to call the laws of mind. Nay, it has been the total want of ſimilarity which has given riſe to the diſtinction which all men, in all ages and countries, have made between mind and matter. This diſtinction is found in all languages; and it is an unpardonable liberty which men take with language when they uſe a *term of diſtinction*, a *ſpecific term*, to expreſs things of a different ſpecies. What theſe authors have been pleaſed to call *mind*, the whole world beſides have called by another name, FORCE; which, though borrowed from our own exertions, is yet ſufficiently diſtinctive, and never leads us to confound things that are different, except in the language of ſome modern philoſophers, who apply it to the laws of the agency of mind; and, when ſpeaking of the force of motives, &c. commit the ſame miſtakes which the followers of Ariſtotle commit in the uſe of the term mind. *Force*, in the language of theſe philoſophers, means what connects the operations of mind; as mind, in the language of Lord Monboddo, is that which connects the operations of body.

13 The principle of motion not diſtinct from matter and mind.

Thoſe are not leſs to blame who conſider this *Nature* of Ariſtotle, this principle of motion, as an exiſtence or ſubſtance different both from matter and from the minds of intelligent creatures. Ariſtotle calls it in ſome places ὥσπερ ψυχη. He might with equal propriety, and equal conſiſtency with his other doctrines, have called mind, ὥσπερ τελος, or an ὥσπερ δυναμις. Beſides, we have no evidence for the ſeparability of this ὥσπερ ψυχη from body as we have for the ſeparability of ſuch minds as our own, the genuine ψυχαι. Nay, his whole doctrines, when maturely conſidered, aſſume their abſolute inſeparability.

14 Elemental minds are an abuſe of language.

This doctrine of elemental minds, therefore, as the immediate cauſes of the phenomena of the material world, is an abuſe of language. It is a jargon; and it is a frivolous abuſe, for it offers no explanation whatever. The phenomena are totally unlike the phenomena of ordinary minds, and therefore receive no explanation from them; and ſince our knowledge of theſe *quaſi* minds muſt be derived entirely from the phenomena, it will be preciſely the ſame, although we expreſs it in common language. We ſhall not indeed raiſe the wonder of our hearers, as thoſe do who fill the world with minds which they never ſuſpected to exiſt; but we ſhall not

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not bewilder their imaginations, confound their ideas, and miſlead their judgments.

15 The dreadful conſequences of materialiſm.

We flatter ourſelves that our readers will not think theſe obſervations unſeaſonable or miſplaced. Of all miſtakes that the naturaliſt can fall into, there is none more fatal to his progreſs in knowledge than the confounding things which are eſſentially different; and of all the diſtinctions which can be made among the objects of our contemplation, there is none of equal philoſophical importance with this between mind and matter: And when we conſider the conſequences which naturally follow from this confuſion of ideas, and particularly thoſe which follow from ſinking the mental faculties of man to a level with the operations of mechanics or chemiſtry, conſequences which the experience of the preſent eventful day ſhows to be deſtructive of all that is noble or deſirable in human nature, and of all that is comfortable in this life, and which blaſts every hope of future excellence—we cannot be too anxious to have this capital diſtinction put in the plaineſt point of view, and expreſſed in the moſt familiar characters, "ſo that he who runneth may read." When we ſee the frenzy which the reaſoning pride of man has raiſed in our neighbourhood, and hear the dictates of philoſophy inceſſantly appealed to in defence of whatever our hearts ſhudder at as ſhocking and abominable; and when we ſee a man (A), of great reputation as a naturaliſt, and of profeſſed humanity and political moderation, congratulating his countrymen on the rapid improvement and almoſt perfection of philoſophy; and after giving a ſhort ſketch of the conſtitution of the viſible univerſe, ſumming up all with a table of elective attractions, and that particular combination and mode of cryſtallization which conſtitutes GOD (*horreſco referens!*)—is it not full time for us to ſtop ſhort, and to aſk our own hearts "whither are you wandering?"—But ſound philoſophy, reaſoning from effects to their cauſes, will here liſten to the words of our ſacred oracles: "By their fruits ye ſhall know them. Do men gather grapes of thorns, or figs of thiſtles?" The abſurd conſequences of the ſceptical philoſophy of Berkeley and Hume have been thought, by men of undoubted diſcernment, ſufficient reaſons for rejecting it without examination. The no leſs abſurd and the ſhocking conſequences of the mechanical philoſophy now in vogue ſhould give us the ſame abhorrence; and ſhould make us abandon its blood-ſtained road, and return to the delightful paths of nature, to ſurvey the works of God, and feaſt our eyes with the diſplays of mind, which offer themſelves on every hand in deſigns of the moſt extenſive influence and the moſt beautiful contrivance. Following the guidance of heavenly wiſdom, we ſhall indeed find, that "all her ways are ways of pleaſantneſs, and all her paths are peace."

16 The extent of philoſophical ſtudy.

Such is the ſcene of our obſervation, the ſubject of philoſophical ſtudy. Its extent is almoſt unbounded, reaching from an atom to God himſelf. It is abſolutely neceſſary for the ſucceſsful cultivation of this immenſe field of knowledge, that it be committed to the care of different cultivators, and that its various portions be treated in different ways: and, accordingly, the various taſtes of men have given this curioſity different directions; and the ſtudy, like all other taſks, has been promoted by this diviſion of labour.

Some philoſophers have attended only to the appearances of fitneſs which are exhibited in every quarter of the univerſe; and by arranging theſe into different claſſes, and interpreting them as indications of thought and intention, have acquired the knowledge of many claſſes of ſentient and intelligent beings, actuated by propenſities, and directed by reaſon.

17 The nature and uſes of animal inſtincts.

While the contemplation of theſe appearances indicates thought and deſign in any individual of one of theſe claſſes, and brings its propenſities and purpoſes of action, and the ends gained by theſe actions, into view, the contemplation of theſe propenſities, purpoſes, and ends, occaſions an inference of a much more general kind. All theſe intelligent beings give indications of knowledge and of power; but their knowledge bears, in general, no proportion to their power of producing changes in nature, and of attaining important ends; and their power is neither always, nor in the moſt important caſes, the conſequence of their knowledge. Where the effect of their actions is moſt eminently conducive to their important intereſts, the power of attaining theſe valuable ends is generally independent on any attention to the fitneſs of the means, and the exertion is frequently made without even thinking of the important end. The well-being of the individual is ſecured againſt any danger from its ignorance, indolence, or inattention, by an inſtinctive propenſity, which leads it to the performance of the neceſſary action, which is thus made immediately and ultimately deſirable, without any regard to its ultimate and important end. Thus, in our own nature, the ſupport of animal life, and the improvement of the means of ſubſiſtence by a knowledge of the objects which ſurround us, are not entruſted to our apprehenſions of the importance of theſe ends, but are committed to the ſurer guides of hunger and curioſity.

18 There is a connection between the individuals of a claſs of animals different from that of reſemblance.

The ſame obſervers diſcover a connection between the individuals of a claſs, different from that which ariſes from the mere reſemblance of their external appearance, or even of their propenſities and purſuits; the very circumſtances which produced the claſſification. They obſerve, that theſe propenſities are ſuch, that while each individual ſeeks only its own enjoyment, theſe enjoyments are in general ſuch as contribute to the ſupport of the ſpecies and the enjoyment of other individuals. Thus, in the claſſes of animals, and in human nature, the continuance of the race, and the enjoyment of the whole, are not entruſted to the apprehenſion we entertain of the importance of theſe ends, but are produced by the operation of ſexual love and the love of ſociety.

19 There is alſo a link of connection between ſentient beings of different claſſes.

The ſame obſervers find that even the *different* claſſes of ſentient beings are connected together: and while the whole of each claſs aim only at their own enjoyment, they contribute, in ſome way or other, to the well-being of the other claſſes. Even man, the ſelfiſh lord

(A) M. de la Metherie, editor of the *Journal de Phyſique*. See his prefaces to the volumes for 1792 and 1793, January and July.

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lord of this ſublunary world, is not the unconnected inhabitant of it. He cannot, in every inſtance, reap all the fruits of his ſituation, without contributing to the enjoyment of thouſands of the brute creation. Nay, it may be proved to the ſatisfaction of every intelligent man, that while one race of animals, in conſequence of its peculiar propenſities, ſubſiſts by the deſtruction of another, the ſum total of animal life and enjoyment is prodigiouſly increaſed. See a very judicious diſſertation on this curious and puzzling ſubject, entitled *A Philoſophical Survey of the Animal Creation*; where it appears that the increaſe of animal life and enjoyment which is produced by this means, beyond what could poſſibly obtain without it, is beyond all conception. See likewiſe the laſt edition of *King's Origin of Evil*, by Dr Law late biſhop of Carliſle.

20 The end of this connection is the accumulation of happineſs.

Thus the whole aſſemblage ſeems connected, and jointly employed in increaſing the ſum total of poſſible happineſs. This fitneſs of the various propenſities of ſentient and intelligent beings, this ſubſerviency to a general purpoſe, ſtrikes theſe obſervers as a mark of intention, evidently diſtinct from, and independent of, all the particular intentions, and ſuperior to them all; and thus it irreſiſtibly leads them to infer the exiſtence of a SUPREME MIND, directing the whole of this INTELLECTUAL SYSTEM, while the individuals of which it conſiſts appear the unconſcious inſtruments in the hand of a great Artiſt, with which he executes his grand and beneficent purpoſes.

21 All nature, animate and inanimate, thinking, and unthinking, is connected.

But the obſervation goes yet further. The bodies of the inanimate creation are not only connected with each other by a mutual dependence of properties, and the relation of cauſation, but they are alſo connected with the ſentient beings by a ſubſerviency to their purpoſes of enjoyment. The philoſopher obſerves that this connection is admirably kept up by the conſtancy of natural operations and the expectations of intelligent beings. Had either of theſe circumſtances been wanting, had either the operations of nature been without rule, or had ſentient beings no perception or expectation of their uniformity; the ſubſerviency would be totally at an end. This adjuſtment, this fitneſs, of which the effect is the enjoyment of the ſentient inhabitants of the univerſe, appear to be the effect of an intention of which this enjoyment is the final cauſe. This conſtancy, therefore, in the operations of nature, both in the intellectual and material world, and the concomitant expectation of ſentient beings, appear the effects of *laws* impoſed on the different parts of the univerſe by the Supreme Mind, who has formed both theſe claſſes of beings ſo admirably ſuited to each other.

22 The origin of natural theology.

To ſuch obſervers the world appears a WORK OF ART, a ſyſtem of means employed for gaining certain propoſed ends, and it carries the thoughts forward to an ARTIST; and we infer a degree of ſkill, power, and good intention in this Artiſt, proportioned to the ingenuity, extent, and happy effect which *we are able to diſcern* in his works. Such a contemplation of nature therefore, terminates in NATURAL THEOLOGY, or the diſcovery of the exiſtence and attributes of GOD.

23 Our mode of reaſoning on the operations of God.

Our notions of this *Supreme Mind* are formed from the indications of deſign which we obſerve, and which we interpret in the ſame way as in the actions of men. Theſe notions, therefore, will differ from our notions of other minds only in the *degrees* which we *are able* to obſerve, and which we aſſign to theſe faculties; for the phenomenon or the effect is not only the mark, but alſo the meaſure of its ſuppoſed cauſe. Theſe degrees muſt be aſcertained by our own capacity of appreciating the extent, the multiplicity, and the variety of the contrivance. Accordingly, the attributes of the Supreme Mind, in the theological creed of a rude Indian, are much more limited than in that of a European philoſopher. In proportion as our underſtandings are enlarged, and as our acquaintance with the operations of nature around us is extended, we ſhall perceive higher degrees of power, of ſkill, and of kind intention: and ſince we find that the ſcene of obſervation is unbounded, we cannot affix any boundaries to theſe attributes in our own imagination, and we are ready to ſuppoſe that they are infinite or unbounded *in their own nature*. When our attentive ſurvey of *this* univerſe, and a careful compariſon of all its parts, as far as we can underſtand or appreciate them, have made us conclude that it is *one* deſign, the work of *one Artiſt*; we are under the neceſſity of inferring, that, with reſpect to *this univerſe*, his power, wiſdom, and benevolence, are indeed infinite.

24 The ſyſtem of nature is governed by general laws.

When men have been led to draw this concluſion from the appearances of fitneſs which are obſerved everywhere around them, they conſider that conſtancy which they obſerve in natural operations, whether in the material or the intellectual ſyſtem, and that expectation of, and confidence in, this conſtancy, which renders the univerſe a ſource of enjoyment to its ſentient inhabitants, as the conſequences of laws impoſed by the Almighty Artiſt on his works, in the ſame manner as they would conſider the conſtancy in the conduct of any people as the conſequences of laws promulgated and enforced by the ſupreme magiſtrate.

25 The nature and progreſs of the ſtudy of mind.

There can be no doubt of this view of nature being extremely captivating, and likely to engage the curioſity of ſpeculative men; and it is not ſurpriſing that the phenomena of mind have been keenly ſtudied in all ages. This part of the ſtudy of nature, like all others, was firſt cultivated in ſubſerviency to the wants of ſocial life; and the general laws of moral ſentiment were the firſt phenomena which were conſidered with attention. This gradually ripened into a regular ſyſtem of moral duty, accompanied by its congenial ſtudy, the inveſtigation or determination of the *ſummum bonum*, or the conſtituents of human felicity; and theſe two branches of intellectual ſcience were always kept in a ſtate of aſſociation by the philoſophers of antiquity.

26 The riſe of moral ſentiments and of moral duty.

Juriſprudence, the ſcience of government, legiſlation, and police, were alſo firſt cultivated as arts, or at leaſt in immediate ſubſerviency to the demands of cultivated ſociety; and all theſe ſo nearly related parts of the ſtudy of human nature, had made a very conſiderable progreſs, in the form of maxims or precepts for directing the conduct, before ſpeculative men, out of mere curioſity, treated them as ſubjects of philoſophical ſtudy. Our moral ſentiments, always involving a feeling of obligation, are expreſſed in a language conſiderably different from the uſual language of pure philoſophy, ſpeaking of things which *ought to be*, rather than of things which *are*; and this diſtinction of language was increaſed by the very aim of the writers, which

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which was generally to influence the conduct as well as the opinions of their ſcholars. It was reſerved for modern times to bring this ſtudy into the pure form of philoſophy, by a careful attention to the phenomena of moral ſentiment, and claſſing theſe according to their generality, and aſcertaining their reſpective ranks by an appeal to experiment, that is, to the general conduct of mankind: and thus it happens that in the modern treatiſes on ethics, juriſprudence, &c. there is leſs frequent reference made to the *officia* or duties, or to the conſtituents of the *ſummum bonum*, than among the ancients, and a more accurate deſcription of the human mind, and diſcrimination of its various moral feelings.

27

The origin of logic and other intellectual ſciences.

It was hardly poſſible to proceed far in theſe diſquiſitions without attending to the powers of the underſtanding. Differences of opinion were ſupported by reaſonings, or attempts to reaſoning. Both ſides could not be in the right, and there muſt be ſome court of appeals. Rules of argumentation behoved to be acquieſced in by both parties; and it could hardly eſcape the notice of ſome curious minds, that there were rules of truth and falſehood as well as of right and wrong. Thus the human *underſtanding* became an object of ſtudy, firſt in ſubſerviency to the demands of the moraliſts, but afterwards for its own ſake; and it gradually grew up into the ſcience of logic. Still further refinement produced the ſcience of metaphyſics, or the philoſophy of univerſals. But all theſe were *in fact* poſterior to the doctrines of morals; and diſquiſitions on beauty, the principles of taſte, the precepts of rhetoric and criticiſm, were the laſt additions to the ſtudy of the phenomena of mind. And now, ſince the world ſeems to have acquieſced in the mode of inveſtigation of general laws by experiment and obſervation, and to agree that this is all the knowledge that we can acquire of any ſubject whatever, it is to be expected that this branch of philoſophical diſcuſſion will attain the ſame degree of improvement (eſtimated by the coincidence of the doctrines with fact and experience) that has been attained by ſome others.

28

The partial practice of natural philoſophy preceded its ſtudy as a ſcience.

The occupations, however, of ordinary life have oftener directed our efforts towards material objects, and engaged our attention on their properties and relations; and as all ſciences have ariſen from arts, and were originally implied in the maxims and precepts of thoſe arts, till ſeparated from them by the curious ſpeculatiſt, the knowledge of the material ſyſtem of nature was poſſeſſed in detached ſcraps by the practitioners in the various arts of life long before the *natural philoſopher* thought of collecting them into a body of ſcientific doctrines. But there have not been wanting in all ages men of curioſity who have been ſtruck by the uniformity of the operations of nature in the material world, and were eager to diſcover their cauſes.

Accordingly, while the moraliſts and metaphyſicians turned their whole attention to the phenomena of mind, and have produced the ſciences of pneumatology, logic, ethics, juriſprudence, and natural theology, theſe obſervers of nature have found ſufficient employment in conſidering the phenomena of the material world.

The bodies of which it conſiſts are evidently connected by means of thoſe properties by which we obſerve that they produce changes in each other's ſituation. This aſſemblage of objects may therefore be juſtly called a ſyſtem. We may call it the MATERIAL SYSTEM. It is frequently termed NATURE; and the terms NATURAL APPEARANCES, NATURAL CAUSES, NATURAL LAWS, have been generally reſtricted to thoſe which take place in the material ſyſtem. This reſtriction, however, is improper, becauſe there is no difference in the manner in which we form our notions of thoſe laws, and reaſon from them, both with reſpect to mind and body. Or if there is to be any reſtriction, and if any part of the ſtudy of the univerſe is to be excluded in the application of theſe terms, it is that part only which conſiders moral obligation, and rather treats of what *ought to be* than of what *is*. As has been already obſerved, there is a conſiderable difference in the language which muſt be employed; but ſtill there is none in the principles of inveſtigation. We have no proof for the extent of any moral law but an appeal to the feelings of the hearts of men, indicated by the general laws or facts which are obſerved in their actions.

29

The nature of the material ſyſtem, with the definition of that and other terms.

30

The unreſtricted ſenſe in which ſome of theſe terms are uſed, and its bad conſequences.

But this is only a queſtion of the propriety of language. And no great inconvenience would ariſe from the reſtriction now mentioned if it were ſcrupulouſly adhered to; but unfortunately this is not always the caſe. Some authors uſe the term *natural law* to expreſs *every* coincidence of fact; and this is certainly the proper uſe of the term. The French writers generally uſe the term *loi phyſique* in this enlarged ſenſe. But many authors, miſled by, or taking advantage of, the ambiguity of language, after having eſtabliſhed a law founded on a copious and perhaps unexcepted induction of the phenomena of the material ſyſtem (in which caſe it muſt be conſidered in its reſtricted ſenſe), have, in their explanation of phenomena, extended their principle much farther than the induction on which they had founded the exiſtence of the phyſical law. They have extended it to the phenomena of mind, and have led their followers into great and dangerous miſtakes. Languages, like every other production of human ſkill, are imperfect. They are deficient in terms, and are therefore figurative. The moſt obvious, the moſt frequent, and the moſt intereſting uſes of language, have always produced the appropriated terms, and the progreſs of cultivation has never completely ſupplied new ones. There are certain analogies or reſemblances, or certain aſſociations of ideas, ſo plain, that a term appropriated to one very familiar object will ſerve to ſuggeſt another analogous to it, when aided by the concomitant circumſtances of the diſcourſe; and this with ſufficient preciſion for the ordinary purpoſes of ſocial communication, and without leading us into any conſiderable miſtakes: and it is only the rare and refined diſquiſitions of the curious ſpeculatiſt that bring the poverty and imperfection of language into view, and make us wiſh for words as numerous as our thoughts. There is hardly a ſentence, even of common diſcourſe, in which there are not ſeveral figures either of ſingle words or of phraſes; and when very accurate diſcrimination is required, it is almoſt impoſſible to find words or phraſes to expreſs diſtinctions which we clearly feel. We believe it impoſſible to expreſs, by the ſcanty vo-

Introduction. cabulary of the Hebrews, the nice diſtinctions of thought which are now familiar to the European philoſopher. In nothing does this imperfection of language appear ſo remarkably as in what relates to mind. Being a late ſubject of ſeparate diſcuſſion, and intereſting only to a few ſpeculatiſts, we have no appropriated vocabulary for it; and all our diſquiſitions concerning its operations are in continual metaphor or figure, depending on very ſlight analogies or reſemblances to the phenomena of the material world. This makes the utmoſt caution neceſſary; and it juſtifies the Britiſh philoſophers, who have been the moſt ſucceſsful in proſecuting the ſtudy of the intellectual ſyſtem, for having, almoſt without exception, reſtricted the terms natural laws, natural cauſes, natural philoſophy, and ſuch like, to the material ſyſtem. With us pneumatology makes no part of phyſics. And we may venture to affirm, that the ſciences have fared better by the reſtriction of the terms. In no country has the ſpirit of liberal diſcuſſion been more encouraged and indulged than in Britain; and her philoſophers have been equally eminent in both branches of ſcience. Their performances in ethics, juriſprudence, and natural theology, are conſidered by all our neighbours as the fountains of knowledge on theſe ſubjects; and Locke and Clarke are names no leſs familiar on the continent than Newton. The licentious and degrading doctrines of the Gallican ſchool have as yet made little impreſſion here; and man is ſtill conſidered among us as a glorious creature, born to, and fitted for, the nobleſt proſpects.

31 The term *phyſics* defined as it is generally underſtood in Britain. Phyſics, then, is with us the ſtudy of the material ſyſtem, including both natural hiſtory and philoſophy. The term is not indeed very familiar in our language; and in place of *phyſicus* and *diſciplina phyſica*, we more generally uſe the terms *naturaliſt* and *natural knowledge*. The term *natural philoſophy*, in its common acceptation, is of leſs extent. The field of phyſical inveſtigation is ſtill of prodigious extent; and its different quarters require very different treatments, make very different returns, and accordingly have engaged in their particular cultivation perſons of very different talents and taſtes. It is of ſome importance to perceive the diſtinctions, and to ſee how the wants and propenſities of men have led them into the different paths of inveſtigation; for, as has been more than once obſerved, all ſciences have ſprung from the humble arts of life, and both go on improving by means of a cloſe and conſtant correſpondence.

32 The phenomena of the material ſyſtem arranged into two claſſes. All the phenomena of the material ſyſtem may be arranged into two claſſes, diſtinguiſhed both by their objects and by the proper manner of treating them.

The firſt claſs comprehends all the appearances which are exhibited in the *ſenſible motions* of bodies, and their actions on each other producing *ſenſible motion*.

The ſecond claſs comprehends the appearances which are exhibited in the *inſenſible* motions and actions of the inviſible particles of matter.

33 Examples of thoſe of the firſt claſs, Of the phenomena of the firſt claſs we have examples in the planetary motions, the motions of heavy bodies, the phenomena of impulſe, the motions and actions of machines, the preſſure and motions of fluids, the ſenſible actions of magnetical and electrical bodies, and the motions of light.

We have examples of the ſecond claſs in the phenomena of heat and mixture, and thoſe exhibited in the growth of animals and vegetables, and many phenomena of ſolid, fluid, magnetical, electrical, and luminous bodies, in which no change of place can be obſerved. 34 and of thoſe of the ſecond.

Thus it appears that there is a diſtinction in the phenomena ſufficiently great to warrant a diviſion of the ſtudy, and to make us expect a more rapid improvement by this diviſion. Nay, the diviſion has been made by nature itſelf, in the acquaintance which men have attained with her operations without ſtudy, before ſcience appeared, and while art conſtituted all our knowledge. 35 This arrangement is apparently natural.

Before man had recourſe to agriculture as the moſt certain means of procuring ſubſiſtence, our acquaintance with external ſubſtances was principally that of the natural hiſtorian; conſiſting of a knowledge of their fitneſs for food, medicine, or accommodation, their places of growth or habitation, and the means of procuring them, depending on their manner of life or exiſtence. It required a ſtudied attention to theſe circumſtances to give riſe to agriculture, which therefore generally made its appearance after men had been in the practice of keeping flocks; by which means they were more at their eaſe, and had ſome leiſure to attend to the objects around them, and in particular to thoſe circumſtances of ſoil and weather which affected the growth of their paſture. 36 Of the progreſs of knowledge in rude ages. 37 The origin of agriculture, phyſic, ſurgery, and chemiſtry.

When agriculture and a rude medicine were thus eſtabliſhed, they were the firſt *arts* which had their foundation in a *ſyſtem of laws*, by which the operations of nature were obſerved to be regulated; and with theſe arts we may begin the *general ſtudy of nature*, which was thus divided into two different branches.

The rude phyſician would be at firſt a collector of *ſpecifics*; but by degrees he would obſerve reſemblances among the *operations* of his drugs, and would claſs them according to theſe reſemblances. He would thus come to attend leſs to the drug than to its mode of operation; and would naturally ſpeculate concerning the connection between the operation and the economy of animal life. His art now becomes a ſcientific ſyſtem, connected by principle and theory, all proceeding on the obſervation of changes produced by one kind of matter on another, but all out of ſight. The frequent recourſe to the vegetable kingdom for medicines would cauſe him to attend much more minutely to the few plants which he has occaſion to ſtudy than the huſbandman can do to the multitude he is obliged to rear. The phyſician muſt learn to think, the huſbandman to work. An analogy between the economy of animal and vegetable life could hardly fail to engage the attention of the phyſician, and would make him a botaniſt, both as a claſſifier of plants and as a philoſopher.

He would naturally expect to unite the ſervices of his drugs by combining them in his recipes, and would be ſurpriſed at his diſappointments. Curious and unexpected changes would frequently occur in his manipulations: the ſenſible qualities, and even the external appearances of his ſimples, would be often changed, and even inverted by their mixture; and their medicinal properties would frequently vaniſh from the compound, and new ones be induced. Theſe are curious, and to him intereſting facts; and he would naturally be inquiſitive af-

Introduction. ter the principles which regulate these changes. His skill in this would by degrees extend beyond the immediate use for the knowledge; and the more curious speculatist would lay the foundations of a most extensive and important science, comprehending all the phenomena of heat and mixture.

Along with this, and springing from the same source, another science must arise, contemplating the appearances of animal and vegetable life, and founded on a careful observation and accurate description of the wonderful machine. The most incurious of men have in all ages been affected by the displays of wisdom and contrivance in the bodies of animals, and immediately engaged in investigation into the uses and functions of their various parts and organs. The phenomena have been gradually discriminated and arranged under the various heads of nutrition, concoction, secretion, absorption, assimilation, rejection, growth, life, decay, disease, and death; and, in conformity to the doctrines which have with greater or less evidence been established on these subjects, the action of medicines, and the whole practice of physic and surgery, has been established in the form of a liberal or scientific art.

38 The origin of the knowledge of the mechanical powers.

The husbandman in the mean time must labour the ground which lies before him. He, too, is greatly interested in the knowledge of the vegetable economy, and forms some systems on the subject by which he regulates his labours: but he sees, that whatever is the nature of vegetable life, he must work hard, and he searches about for every thing which can tend to diminish his labour. The properties of the lever, the wedge, and the inclined plane, soon become familiar to him; and without being able to tell on what their efficacy depends, he uses them with a certain sagacity and effect. The strength of timber, the pressure and force of water, are daily seen and employed by him and other artisans who labour for their mutual accommodation; and some rude principles on these subjects are committed to memory. Many tools and simple machines are by this time familiar; and thus the *general* properties of matter, and the general laws of the actions of bodies on each other, become gradually matter of observation and reflection; and the practical mechanic will be frequently improving his tools and machines. The general aim is to produce a greater quantity of work by the same exertion. The attempts to improvement will be awkward, and frequently unsuccessful. When a man finds, that by increasing the length of his lever he increases his power of overcoming a resistance, a small degree of curiosity is sufficient to make him inquire in what proportion his advantage increases. When he finds that a double length gives him a double energy, he will be surprised and mortified to find, that at the end of the day he has not performed twice the quantity of work: but, after much experience, he will learn that every increase of energy, by means of a machine, is nearly compensated by an increase of time in the performance of his task; and thus one of the great and leading principles of practical mechanics was inculcated in a manner not to be forgotten, and the practical mechanic was brought to speculate about motion and force, and by gradual and easy steps the general laws of simple motions were established.

39 The origin of mathematics.

It is evident that these speculations cannot be carried on, nor any considerable knowledge acquired, without some acquaintance with the art of measurement: and the very questions which the mechanic wishes to solve, presuppose some advances in this art, which in process of time refined itself into mathematics, the most perfect of all the sciences. All the phenomena of sensible motion afford employment to the mathematician. It is performed in a double or triple time, through a double or triple space, by a double or triple body, by the exertion of a double or triple force, produces a double or triple effect, is more to the right or to the left, upwards or downwards, &c. In short, every affection of motion is an object of mathematical discussion. Such a science must have appeared ere now in the form of an art, in consequence of the mutual transactions of men. These among an uncultivated people are chiefly in the way of barter. If I want corn from a peasant, and have nothing to give for it but the cloth which I have made, we must fall on some way of adjusting our terms in respect of the quantity. We should soon discover that the length, and breadth, and depth, of the box or bag, were equally important; and it was not difficult to see, that if any of them were doubled or tripled, the quantity of grain would be so too; if two of them were doubled, the grain would be quadrupled; and if all the three were doubled the quantity of grain would be increased eight times: the same thing would be observed with respect to my cloth. By such transactions as these, a few of the properties of plane and solid numbers and figures would become known, and the operations of multiplication and division, where arithmetic is combined with geometry: and daily observation shows us, that the more abstruse properties of number and figure, which to the generality of mankind are so insignificant, lay hold on the fancy of some individuals with such force, as to abstract them from every other intellectual entertainment, and are studied with a keenness and perseverance almost unequalled in any other walk of science. To most men the performance of a machine is a more attractive object than the properties of a figure, and the property of a figure more entertaining than that of a number; but the fact seems to have been otherwise. Before Pythagoras had invented the theorem that bears his name (see PHILOSOPHY, N° 15. and note H), and which is among the first elements of geometry, he had reformed the Grecian music by the addition of a note to their scale, and this addition proceeds on a very refined speculation on the properties of numbers; so that among the Greeks arithmetic must have made considerable progress, while geometry was yet in its cradle; and we know to what astonishing length they prosecuted the science of pure geometry, while their knowledge of mechanical principles was almost nothing. Also the Arabs hardly made any addition to the geometry of the Greeks, if they did not rather almost completely forget it; whilst they improved their arithmetic into algebra, the most refined and abstracted branch of human knowledge. There is such a distance, in point of simplicity, between pure mathematics and the most elementary mechanics, that the former continued to make rapid steps to improvement in more modern times, while the latter languished in its infancy, and hardly deserved the name of science till very lately, when the great demand for it, by the increase and improvement in manufactures, both interested many in the study, and facilitated its progress, by the multitude of machines which were contriving on all hands by the manufacturers and artisans; and even at present it must be

be acknowledged, that it is to them that we are indebted for almoſt every new invention in mechanics, and that the ſpeculatiſt ſeldom has done more than improve the invention, by exhibiting its principles, and thus enabling the artiſt to correct its imperfections; and now ſcience and art go hand in hand, mutually giving and receiving aſſiſtance. The demands of the navigator for mathematical and aſtronomical knowledge have dignified theſe ſciences; and they are no longer the means of elegant amuſement alone, but merit the munificence of princes, who have erected obſervatories, and furniſhed voyages of diſcovery, where the mathematical ſciences are at the ſame time cheriſhed and applied to the moſt important purpoſes.

This ſhort ſketch of what may be called *the natural hiſtory of phyſical ſciences* will not, we hope, be thought improper or unprofitable. It tends to confirm an aſſertion often alluded to, that the proſecution of the ſtudy of nature will be more ſucceſsful, if we imitate her mode of proceeding, and divide the labour. It will be ſtill further confirmed by attending to the ſcientific difference of the phenomena, which marks out a different mode of proceeding, and a difference in the knowledge which we ſhall ultimately acquire, after our moſt ſucceſsful reſearches.

40 The connecting principle of concomitant events is totally unknown.

In both claſſes of phenomena already diſtinguiſhed (Nº 6.) we muſt grant, that the principle which connects the pairs of concomitant events, rendering the one the inſeparable companion of the other, is totally unknown to us, becauſe it is not the immediate object of our perception.

41 In the firſt claſs, however, the exertion of this principle may be accurately obſerved,

But in the phenomena of the firſt claſs, we ſee the *immediate* exertion of this principle, whatever it may be; we can obſerve the exertion with accuracy; we can determine its kind and degree, which are the ſigns and meaſures of the kind and degree of the unperceived cauſe. This exertion, being always ſome modification of motion, allows us to call in the aid of mathematical knowledge, and thus to aſcertain with the preciſion peculiar to that ſcience the energy of the cauſe, judging of the tendency and quantity by the tendency and the quantity of the obſerved effect.

42 but not in the ſecond:

But in the ſecond claſs of phenomena the caſe is very different. In the operations of chemiſtry, for inſtance, the *immediate* exertion of the cauſe is not perceived: all that we obſerve is the aſſemblage of particles which obtains before mixture, and that which takes place when it is completed, and which we conſider as its reſult. The procedure of nature in producing the change is unſeen and unknown. The ſteps are hid from our obſervation. We are not only ignorant of the cauſe which determines one particle of our food to become a part of our body while others are rejected, but we do not ſee the operation. We are not only ignorant of the cauſe which determines a particle of vitriolic acid to quit the foſſil alkali with which it is united in Glauber ſalt, and to attach itſelf to a particle of magneſia already united with the muriatic acid, which alſo quits it to unite with the alkali, but we do not ſee the operation. The particles and their motions are not the objects of our ſenſes; and all that we ſee is the Epſom ſalt and common ſalt ſeparated from the water in which we had formerly diſſolved the ſal mirabile and the muriated magneſia. The motions, which are the *immediate* effects of the changing cauſes, and therefore their *only indications, characteriſtics and meaſures*, fitted to ſhow their nature, are hid from our view.

43 And therefore the phenomena of the ſecond claſs are leſs underſtood.

Our knowledge therefore of theſe phenomena muſt be leſs perfect than that of the phenomena of the former claſs; and we muſt here content ourſelves with the diſcovery of more remote relations and remote cauſes, and with our ignorance of the very powers of nature by which theſe changes are brought about, and which are cognoſcible only by their immediate effects, viz. the motions which they produce unſeen. The knowledge which we do really acquire is ſomewhat ſimilar to what the mechanical philoſopher has acquired when he has diſcovered, by many experiments and inveſtigations, that magnets attract each other by their diſſimilar poles, and repel each other by their ſimilar poles, and do not act at all on any bodies but loadſtones and iron. Here we leave undiſcovered all that is moſt curious in the phenomenon, viz. how theſe attractions and repulſions are produced; and even here the magnetical philoſopher has the advantage of ſeeing the agents and the operation.

44 Though ſome philoſophers have attempted to explain them by the doctrine of motion;

But philoſophers attending to this circumſtance, that, even in theſe caſes, the changes are produced by motions, or conſiſt in motions, however unperceived theſe may be, have concluded, that the laws according to which nature operates in producing theſe changes are ſimilar to the laws which regulate her operations in the ſenſible actions of bodies, or are included in them; and that the motions, though unſeen, and the moving forces, are perfectly ſimilar. They have therefore employed ſimilar modes of inveſtigation, applying the laws of impulſe, and calling in the aid of mathematical knowledge.

Of this we have many examples in the writings of Dr Freind, Keil, Bernouilli, Helſham, Boerhaave, Hartley, and others, who have delivered theories of fermentation, ſolution, precipitation, cryſtallization, nutrition, ſecretion, muſcular action, nay even of ſenſation and intelligence, founded, as they think, on the laws of motion, and illuſtrated and ſupported by mathematical reaſoning. Lord Bacon himſelf, that careful and ſagacious diſtinguiſher of intellectual operations, has gone into the ſame track in his explanation of the phenomena of fire and combuſtion: and Sir Iſaac Newton has made ſeveral attempts of the ſame kind, although with peculiarities which always characteriſe his diſcuſſions, and make them very different from thoſe of an inferior claſs.

45 but their attempts have been unſucceſsful.

But the ſucceſs of theſe philoſophers has hitherto been very diſcouraging: indeed they had no title to expect any; for their whole trains of reaſoning have proceeded on analogies which were not obſerved, but aſſumed or *ſuppoſed* without any authority. There is not that ſimilarity in the phenomenon, or in the viſible effect, which is abſolutely neceſſary for a ſucceſsful reaſoning by analogy. We do not obſerve any local motion, any change of place, which alone enables us to reaſon mathematically on the ſubject. And to make the caſe deſperate, this ill-founded analogy has been mixed with hypotheſes completely gratuitous. Certain forms have been aſſigned to the particles, and certain modes of action have been laid down for them, for whoſe reality we have not the leaſt argument or indication: and to complete the matter, theſe fancied forms and laws of action have been ſuch as are either ſelf-contradictory and inconſiſtent, or

they have been ſuch as, if allowed to act in a way analogous to what we obſerve in the ſenſible motions of bodies, would produce effects totally different from thoſe which are obſerved. Theſe atomical theories, as they are called, tranſgreſs every rule of philoſophical diſcuſſion, and even the beſt of them are little better than trifling amuſements. By far the greateſt part of them only ſerve to raiſe a ſmile of pity and contempt in every perſon at all acquainted with mechanical philoſophy. Whenever we ſee an author attempting to explain theſe hidden operations of nature by inviſible fluids, by æthers, by colliſions, and vibrations, and particularly if we ſee him introducing mathematical reaſonings into ſuch explanations—the beſt thing we can do is to ſhut the book, and take to ſome other ſubject. That we may not be thought to ſpeak preſumptuouſly on this occaſion, we only beg leave to remind our readers, that the united knowledge of the moſt eminent mathematicians of Europe has not yet been able to give any thing more than an approximation to the ſolution of the problem of three bodies; that is, to determine with accuracy the motions of three particles of matter acting on each other in the ſimpleſt of all poſſible manners, viz. by forces varying as the ſquares of the diſtances inverſely; and the vibrations of elaſtic bodies, of any but the very ſimpleſt poſſible forms, are to this day beyond the reach of inveſtigation. What then ſhould be our expectations in caſes where millions of particles are acting at once, of forms unobſerved, and with forces unknown, and where the object is not a determination of an average reſult of many, where the preciſe ſtate of an individual particle need not be known, but where it is this very preciſe ſtate of each ſingle particle that we want to know? What can it be but uncertainty and miſtake?

46
The advantage derived in theſe ſpeculations from mathematical philoſophy.

Notwithſtanding theſe diſcouraging circumſtances, we muſt obſerve that this kind of inquiry has greatly improved of late years, along with the improvement and extenſion of mathematical philoſophy, and ſince philoſophers have given over their inceſſant attempts to explain every thing by impulſe; and we need not deſpair of making ſtill farther advances, if we will content ourſelves with going no farther than Newton has done in his explanation of the planetary motions. He has immortalized his own name, and has added immenſely to our ſtock of uſeful knowledge: yet he has ſtopped ſhort at the diſcovery of the fact of univerſal gravitation; and all who have endeavoured to explain or account for this fact have only expoſed themſelves to pity. We may perhaps be one day able to demonſtrate from the phenomena that the particles of matter have certain mutual tendencies to or from each other, exerted according to fixed or invaried rules; and from theſe tendencies we may be able to explain many other phenomena, and predict the conſequences, with as much certainty and evidence as an aſtronomer calculates a future eclipſe. This would be a great acquiſition, and perhaps more is impoſſible: and the road to this has been hinted by Sir Iſaac Newton, who has expreſſed his ſuſpicion, that as the great movements of the ſolar ſyſtem are regulated by univerſal gravitation, ſo the mutual actions of the particles of matter are produced and regulated by tendencies of a ſimilar kind, *equally* but not *more* inexplicable, and of which the laws of action are to be diſcovered by as careful an attention to the phenomena, and by the ſame patient thinking, which he has employed on the planetary motions. And a beautiful introduction to this new and almoſt unbounded field of inquiry has been given us by the celebrated Abbé Boſcovich, in his Theory of Natural Philoſophy, where he has ſhown how ſuch mutual tendencies, ſimilar in every ultimate particle of matter, and modified by conditions that are highly probable, nay almoſt demonſtrable, will not only produce the ſenſible forms of ſolidity, hardneſs, elaſticity, ductility, fluidity, and vapour, under an inconceivable variety of ſubordinate appearances, and the obſerved laws of ſenſible motion, but will go far to explain the phenomena of fuſion, congelation, ſolution, cryſtallization, &c. &c. &c. both in chemiſtry and phyſiology. We earneſtly recommend this work to the peruſal of all who wiſh to obtain a diſtinct notion of the internal conſtitution of natural bodies, and of the way in which the uniting forces produce their ultimate and ſenſible effects. Any perſon, poſſeſſed of a moderate ſhare of mathematical knowledge, will be convinced that the proceſs of nature is not very different from what he deſcribes; and that much of what we obſerve muſt happen as he ſays, even although the ultimate atoms of matter are not inextended mathematical points, accompanied with attracting and repelling forces.

47
Our ignorance ſtill great, and the probable increaſe of knowledge among poſterity.

But we have many ſteps to make before we begin this ſtudy: Nature opens to us an immenſe volume; and we doubt not that our poſterity will long find employment in the peruſal, even though advancing with the eagerneſs and ſucceſs of the laſt century. We have not yet arrived at the threſhold in many parts of this reſearch: In many parts of chemiſtry, for inſtance, we are as yet uncertain with reſpect to the phenomena themſelves, which are to be the ſubjects of this diſcuſſion. The compoſition of bodies muſt be fully underſtood before we begin to ſpeak of the forces which unite their particles, or ſpeculate about their modes of action. As long as water was conſidered as an element, we were ignorant of the forces inherent in its particles; we are, perhaps, ſtill ignorant of this; but we now know that they are extremely different from what we formerly ſuppoſed them to be. It is but in a very few, if in any, caſes of chemical combination, that we even know what are the ingredients: till we know this, it is too ſoon to ſpeculate about their mode of union. Our ignorance in the real events in the animal and vegetable economy is ſtill greater. Our firſt taſk therefore is to proceed, as we are now doing, in the accurate examination and claſſification of the phenomena themſelves; and, without attempting to bring them within the pale of mathematical philoſophy, by attempting what are called mechanical explanations, let us give up the conſideration of theſe hidden operations, and augment to the utmoſt our liſt of ſecondary laws of viſible but remote connections. All the mechanical ſpeculations of the honourable Robert Boyle about the ſenſible qualities of things are now forgotten; but his chemical experiments preſerve all their value, and are frequently referred to. The ſame may be ſaid of the ſagacious Dr Hales, whoſe fanciful notions of internal conflicts, and colliſions, and vibrations, derogate nothing from the value of the curious facts which he has eſtabliſhed both in the animal and vegetable economy.

48
The particular diviſions of phyſical ſcience in Britain.

This diſtinction in the nature of the phenomena, and this difference in the nature of the knowledge which is to be acquired, and the means which are to be employed

Introduction.

ployed for the succesful prosecution of these two branches of general physics, has occasioned a still farther restriction (at least in Britain) of the term NATURAL PHILOSOPHY. It is particularly applied to the study of the phenomena of the first class, while those of the second have produced the sciences of CHEMISTRY and PHYSIOLOGY.

Natural philosophy and chemistry have generally been made particular institutions in our seminaries of learning, but physiology has more commonly been taught in conjunction with anatomy, medicine, and botany.

The phenomena of the first class have been usually called MECHANICAL, in order to distinguish them from those observed in the operations of chemistry, and in the animal and vegetable economy; and the explanations which have been attempted of some of the last, by applying the laws observed in the phenomena of the first class, have been called *mechanical explanations*.

As this first class is evidently but a part of general physics, there is some impropriety in giving the name *natural philosophy* to a course of doctrines which is confined to these alone. Indeed at the first institution of universities, the lectures given in the *Schola Physica* were much more extensive, comprehending almost all the phenomena of the material world: but as all arts and sciences have improved most where the labour has been most divided, it was found more conducive to the advancement of knowledge that separate institutions should be founded for the studies of natural history, chemistry, physiology, &c.; and thus the phenomena, purely mechanical, and a few others in magnetism, electricity, and optics, which either were susceptible of mathematical treatment, or had little connection with the studies of chemistry and physiology, were left to the care of the professor of natural philosophy.

As the terms *chemistry* and *physiology* have been applied to two very important branches of general physics, we think that a more specific or characteristic name might be appropriated to the other, and that it might very properly be termed MECHANICAL PHILOSOPHY.

It only remains to make a few observations on the distinctive means of prosecuting these studies with success, and to point out some of the advantages which may reasonably be expected from a careful prosecution of them: and as the second branch has been fully treated under the several articles of CHEMISTRY, PHYSIOLOGY, &c. we shall confine ourselves to what is usually called NATURAL PHILOSOPHY.

49
Mechanical philosophy defined, and its principles explained.

MECHANICAL PHILOSOPHY may, in conformity with the foregoing observations, be defined, "the study of the sensible motions of the bodies of the universe, and of their actions producing sensible motions, with the view to discover their causes, to explain subordinate phenomena, and to improve art."

The principle upon which all philosophical discussion proceeds is, that *every change which we observe in the condition of things is considered by us as an effect, indicating the agency, characterising the kind, and measuring the degree, of its cause.*

In the language of mechanical philosophy, the cause of any change of motion is called a moving or changing FORCE.

Mechanical Philosophy.

The disquisitions of natural philosophy must therefore begin with the consideration of motion, carefully noticing every affection or quality of it, so as to establish marks and measures of every change of which it is susceptible; for these are the only marks and measures of the changing forces. This being done, it only remains to apply them to the motions which we observe in the universe.

50
The laws of motion and their application.

From the general principle of philosophical discussion already mentioned, there flow directly two axioms.

1. *Every body perseveres in a state of rest, or of uniform rectilineal motion, unless affected by some moving force.*

2. *Every change of motion is in the direction and in the degree of the force impressed.*

These are usually called the LAWS OF MOTION. They are more properly laws of human judgment, with respect to motion. Perhaps they are necessary truths, unless it be alleged that the general principle, of which they are necessary consequences, is itself a contingent though universal truth.

By these two axioms, applied *in abstracto* to every variety of motion, we establish a system of general doctrines concerning motions, according as they are simple or compounded, accelerated, retarded, rectilineal, curvilineal, in single bodies, or in systems of connected bodies; and we obtain corresponding characteristics and measures of accelerating or retarding forces, centripetal or centrifugal, simple or compound.

We have an illustrious example of this abstract system of motion and moving forces in the first book of Sir Isaac Newton's Mathematical Principles of Natural Philosophy. Euler's *Mechanica sive Scientia Motus*, Herman's *Phoronomia sive de Viribus Corporum*, and D'Alembert's *Traité de Dynamique*, are also excellent works of the same kind. In this abstract system no regard is paid to the casual differences of moving forces, or the sources from which they arise. It is enough to characterise a double accelerating force, for instance, that it produces a double acceleration. It may be a weight, a stream of water, the pressure of a man; and the force, of which it is said to be double, may be the attraction of a magnet, a current of air, or the action of a spring.

Having established these general doctrines, the philosopher now applies them to the *general* phenomena of the universe, in order to discover the nature of the forces which really exist, and the laws by which their operations are regulated, and to explain interesting but subordinate phenomena. This is the chief business of the mechanical philosopher; and it may with some propriety be called *the mechanical history of nature.*

51
Of the arrangement of the mechanical phenomena of the universe.

Some method must be followed in this history of mechanical nature. The phenomena must be classed by means of their resemblances, which infer a resemblance in their causes, and these classes must be arranged according to some principle. We have seen no method which appears to us less exceptionable than the following.

52
The generality of the phenomena is the principle of arrangement.

The principle of arrangement is the generality of the phenomena; and the propriety of adopting this principle, arises from the probability which it gives us of more readily discovering the most general actuating forces, whose agency is implicated in all other phenomena of less

leſs extent; and therefore ſhould be previouſly diſcuſſed, that we may detect the diſcriminating circumſtances which ſerve to characteriſe the ſubordinate phenomena, and are thus the marks of the diſtinguiſhing and inferior natural powers.

53
The laws of motion are firſt applied to aſtronomical phenomena.

The moſt general of all phenomena is the curvilinear motion of bodies in free ſpace; it is obſerved through the whole extent of the ſolar ſyſtem.

The mechanical hiſtory of nature begins therefore with aſtronomy. Here, from the general phenomena of the planetary motions, is evinced the *fact* of the mutual deflection of every body towards every other body, and this in the inverſe proportion of the ſquares of the diſtance, and the direct proportion of the quantity of matter. This is the fact of UNIVERSAL GRAVITATION, indicating the agency, and meaſuring the intenſity, of the univerſal force of mutual gravity.

Having eſtabliſhed this as an univerſal fact, the natural philoſopher proceeds to point out all the particular facts which are comprehended under it, and whoſe peculiarities characteriſe the different movements of the ſolar ſyſtem. That is, in the language of philoſophy, he gives a theory or explanation of the ſubordinate phenomena; the elliptical motions of the planets and comets, their mutual diſturbances; the lunar irregularities; the oblate figure of the planets; the nutation of the earth's axis; the preceſſion of the equinoxes; and the phenomena of the tides and trade winds: and he concludes with the theory of the parabolic motion of bodies projected on the ſurface of this globe, and the motion of pendulums.

54
The application of this ſcience to the arts of life.

As he goes along, he takes notice of the applications which may be made to the arts of life of the various doctrines which are ſucceſſively eſtabliſhed; ſuch as chronology, aſtronomical calculation, dialling, navigation, gunnery, and the meaſuring of time.

55
The nature of gravitation,

If a ſquare parcel of ſand be lying on the table, and the finger be applied to any part of it to puſh it along the table, that part is removed where you will, but the reſt remains in its place; but if it is a piece of ſand-ſtone of the ſame materials and ſhape, and the finger is applied as before, the whole is moved; the other parts accompany the part impelled by the finger in all its motions.

56
and of coheſion.

From the moon's accompanying the earth in all its motions round the ſun, we infer a moving force which connects the moon and earth. In like manner, we muſt conclude that a moving force connects the particles of the ſtone; for we give the name *force* to every thing which produces motion: We call it the force of COHESION; a term which, like gravitation, expreſſes merely a fact.

This ſeems to be the next phenomenon of the univerſe in point of extent.

57
Mode of inveſtigating the laws of coheſion.

Having, from the general phenomenon, eſtabliſhed the exiſtence of this force, the philoſopher proceeds to aſcertain the laws by which its exertions are regulated; which is the aſcertaining its diſtinctive nature and properties. This he does in the ſame way that he aſcertained the nature of planetary gravitation, viz. by obſerving more particularly the various phenomena.

Here is opened a moſt extenſive and varied field of obſervation, in which it muſt be acknowledged that very little regular and marked progreſs has been made. The variety in the phenomena, and the conſequent variety in the nature of the connecting forces, appear as yet inconceivably great; and there ſeems little probability of our being able to detect in them all any ſameneſs, combined with the other diſtinguiſhing circumſtances, as we have done in the caſe of gravity. Yet we ſhould not deſpair. Boſcovich has ſhown, in the moſt unexceptionable manner, that although we ſhall ſuppoſe that every atom of matter is endued with a perfectly ſimilar force, acting in a certain determined ratio of the ſmall and imperceptible diſtances at which the particles of matter are arranged with reſpect to each other, the external or ſenſible appearances may, and muſt, have all that variety which we obſerve. He alſo ſhows very diſtinctly how, from the operation of this force, muſt ariſe ſome of the moſt general and important phenomena which characteriſe the different forms of tangible bodies.

We obſerve the chief varieties of the action of this CORPUSCULAR force on the bodies which we denominate *hard, ſoft, ſolid, fluid, vaporous, brittle, ductile, elaſtic*. We ſee inſtances where the parts of bodies avoid each other, and require external force to keep them together, or at certain ſmall diſtances from each other. This is familiar in air, vapours, and all compreſſible and elaſtic bodies.

This is evidently a moſt curious and intereſting ſubject of inveſtigation. On the nature and action of theſe corpuſcular forces depends the ſtrength or firmneſs of ſolids, their elaſticity, their power of communicating motion, the preſſure, and motion, and impulſe of fluids; nay, on the ſame actions depend all the chemical and phyſiological phenomena of expanſion, fuſion, congelation, vaporiſation, condenſation, ſolution, precipitation, abſorption, ſecretion, fermentation, and animal and vegetable concoction and aſſimilation.

Out of this immenſe ſtore of phenomena, this inexhauſtible fund of employment for our powers of inveſtigation, the natural philoſopher ſelects thoſe which lead directly to the production or modification of ſenſible motion.

He will therefore conſider,

58
The production of motion by impulſe has been thought the moſt familiar fact in nature.

1. The communication of motion among detached and free bodies, eſtabliſhing the laws of impulſe or colliſion. This has always been conſidered as the elementary doctrine of mechanical philoſophy, and as the moſt familiar fact obſerved in the material world; and in all ages philoſophers have been anxious to reduce all actions of bodies on each other to impulſe, and have never thought a phenomenon completely explained or accounted for till it has been ſhown to be a caſe of impulſe. This it is which has given riſe to the hypotheſes of vortices, ethers, magnetic and electric fluids, animal ſpirits, and a multitude of fancied intermediums between the ſenſible maſſes of matter, which are ſaid in common language to act on each other. A heavy body is ſuppoſed to fall, becauſe it is impelled by a ſtream of an inviſible fluid moving according to certain conditions ſuited to the caſe. The filings of iron are ſuppoſed to be arranged round a magnet, by means of a ſtream of magnetic fluid iſſuing from one pole, circulating perpetually round the magnet, and entering at the other pole, in the ſame manner as we obſerve the flote-graſs arranged by the current of a brook.

59
But this opinion is very queſtionable.

But the philoſopher who has begun the mechanical ſtudy of nature by the abſtract doctrines of dynamics, and made its firſt application to the celeſtial phenomena, and who has attended carefully to the many analogies

logies between the phenomena of gravitation and coheſion, will be at leaſt ready to entertain very different notions of this matter. He will be ſo far from thinking that the production of motion by impulſe is the moſt familiar fact in nature, that he will acknowledge it to be comparatively very rare; nay, there are ſome appearances in the facts, which are uſually conſidered as inſtances of impulſion, which will lead him to doubt, and almoſt to deny, that there has *ever been obſerved* an inſtance of one body putting another in motion by coming into abſolute contact with it, and ſtriking it; and he will be diſpoſed to think that the production of motion in this caſe is preciſely ſimilar to what we obſerve

60 Motion ſeems to be produced from the equality of action and reaction.

when we gently puſh one floating magnet towards another, with their ſimilar poles fronting each other. There will be the ſame production of motion in the one and diminution of it in the other, and the ſame uniform motion of the common centre of gravity: and, in this caſe of the magnets, he ſees completely the neceſſity of a law of motion, which is not an axiom, but is obſerved through the whole of nature, and which receives no explanation from any hypotheſis of an intervening fluid, but is even totally inconſiſtent with them. We mean, "that every action of one body on another is accompanied by an equal and oppoſite action of that other on the firſt." This is uſually called the *equality of action and reaction:* it is not intuitive, but it is univerſal; and it is a neceſſary conſequence of the perfect ſimilarity of the corpuſcular forces of the ſame kinds of matter. This general fact, unaccountable on the hypotheſis of impelling fluids, is conſidered in the planetary motions as the unequivocal indication of the ſameneſs of that gravity which regulates them all. The rules of good reaſoning ſhould make us draw the ſame concluſion here, that the particles of tangible matter are connected by equal and mutual forces, which are the *immediate cauſes* of all their ſenſible actions, and that theſe forces, like gravitation, vary with every change of diſtance and ſituation.

The laws of colliſion and impulſion being now eſtabliſhed, either as original facts or as conſequences of the agency of equal and mutual forces which connect the particles of matter, the philoſopher conſiders,

61 Of motion as it reſpects the theory of machines, &c.

2. The production of motion by the intervention of ſolid bodies, where, by reaſon of the coheſion of matter, ſome of the motions are neceſſarily confined to certain determinate paths or directions. This is the caſe in all motions round fixed points or axes, or along planes or curves which are oblique to the action of the forces.

62 MECHANICS.

This part of the ſtudy contains the theory of machines, pointing out the principles on which their energy depends, and conſequently furniſhing maxims for their conſtruction and improvement. But theſe obſervations do not complete the diſcuſſion of the mechaniſm of ſolid bodies: they are not only ſolid and inert, but they are alſo heavy; therefore the action of gravity muſt be combined with the conſequences of ſolidity. This will lead to diſcuſſions about the centre of gravity, the theory and conſtruction of arches and roofs, the principles of ſtability and equilibrium, the attitudes of animals, and many particulars of this kind.

63 The nature and definition of fluidity.

3. The philoſopher will now turn his attention to another form, in which tangible matter exhibits many intereſting phenomena, viz. FLUIDITY. The firſt thing to be attended to here is, *What is that particular form of exiſtence?* What is the preciſe phenomenon which characteriſes fluidity? What is the definition of a fluid? This is by no means an eaſy queſtion, and conſiderable objections may be ſtated againſt any definition that has been given of it. Sir Iſaac Newton ſays, that *a fluid is a body whoſe particles yield to the ſmalleſt impreſſion, and by ſo yielding are eaſily moved among themſelves.* It may be doubted whether this be ſufficiently preciſe; what is meant by the *ſmalleſt impreſſion?* and what is *eaſily* moving? Is there any preciſe degree of impreſſion to which they do not yield; and do they oppoſe any reſiſtance to motion? And a ſtronger objection may be made: It is not clear that a body ſo conſtituted will exhibit all the appearances which a body acknowledged to be fluid does really exhibit. Euler offers ſome very plauſible reaſons for doubting whether it will account for the horizontal ſurface, and the complete propagation of preſſure through the fluid in every direction; and therefore prefers ſelecting *this laſt phenomenon,* the propagation of preſſure *quaqua verſum,* as the characteriſtic of fluidity, becauſe a body having this conſtitution (on whatever circumſtances it may depend) will have every other obſerved property of a fluid. But this definition is hardly ſimple or perſpicuous enough; and we think that the objections againſt Newton's more ſimple and intelligible definition are not unanſwerable. Boſcovich defines a fluid to be, *a body whoſe particles exert the ſame mutual forces in all directions;* and ſhows, that ſuch particles muſt be indifferent, as to any poſition, with reſpect to each other. If no external force act on them, they will remain in every poſition, and will have no tendency to arrange themſelves in one poſition rather than another; differing in this reſpect from the particles of ſolid, or ſoft, or viſcid bodies; which require ſome force to change their reſpective poſitions, and which recover theſe poſitions again when but gently diſturbed. He illuſtrates this diſtinction very beautifully, by comparing a parcel of balls thrown on quickſilver, and attracting each other, with a parcel of magnets in the ſame ſituation. The balls will ſtick together, but in *any poſition;* whereas the magnets will always affect a particular arrangement.

64 Of the preſſure and equilibrium of fluids, or hydroſtatics.

When the characteriſtic phenomenon of fluidity has been ſelected, the philoſopher proceeds to combine this property with gravity, and eſtabliſhes the doctrines of HYDROSTATICS, or of the preſſure and equilibrium of heavy fluids, the propagation of this preſſure in every direction; and demonſtrates the horizontality of ſurface aſſumed by all perfect fluids.

Theſe doctrines and principles enable us to determine ſeveral very intereſting circumſtances reſpecting the mutual preſſure of ſolids and fluids on each other; the preſſures exerted on the bottoms and ſides of veſſels; the ſupport and whole mechaniſm of floating bodies, &c.

65 Of the motion of fluids, or hydraulics.

He then conſiders how fluids will move when their equilibrium of preſſure is deſtroyed; and eſtabliſhes the doctrines of HYDRAULICS, containing all the modifications of this motion, ariſing from the form of the veſſels, or from the intenſity or direction of the preſſure which occaſions it. And this ſubject is completed by the conſideration of the reſiſtance which fluids oppoſe to the motion of ſolid bodies through them, and their impulſe on bodies oppoſed to their action.

Theſe are very important matters, being the foundations of many mechanical arts, and furniſhing us with ſome of our moſt convenient and efficacious powers for impelling

impelling machines. They are alſo of very difficult diſcuſſion, and are by no means completely inveſtigated or eſtabliſhed. Much remains yet to be done both for perfecting the theories and for improving the arts which depend on them.

66 The importance and difficulty of theſe branches of ſcience.

It is evident, that on theſe doctrines depend the knowledge of the motions of rivers and of waves; the buoyancy, equilibrium, and ſtability of ſhips; the motion of ſhips through the waters; the action of the winds on the ſails; and the whole arts of marine conſtruction and ſeamanſhip.

67 The nature and definition of vapour.

There is another general form of tangible matter which exhibits very different phenomena, which are alſo extremely intereſting; we mean that of VAPOUR. A vapour is a fluid; and all the vapours that we know are heavy fluids: they are therefore ſubject to all the laws of preſſure and impulſe, which have been conſidered under the article HYDRODYNAMICS. But they are ſuſceptible of great compreſſion by the action of external forces, and expand again when theſe forces are removed. In conſequence of this compreſſion and expanſion, the general phenomena of fluidity receive great and important modifications; and this claſs of fluids requires a particular conſideration. As air is a familiar inſtance, this branch of mechanical philoſophy has been called PNEUMATICS.

68 The doctrine of air or pneumatics.

Under this head we conſider the preſſure of the atmoſphere, and its effects, both on ſolid and fluid bodies. It produces the riſe of waters or other fluids in pumps and ſyphons, and gives us the theory of their conſtruction: it explains many curious phenomena of nature, ſuch as the motions in the atmoſphere, and their connection with the preſſure of the air, and its effect on the barometer or weather-glaſs. Air, when in motion, is called *wind;* and it may be employed to impel bodies. The theory of its action, and of its reſiſtance to moving bodies, are therefore to be conſidered in this place.

But beſides their motions of progreſſion, &c. ſuch as we obſerve in winds, compreſſible or elaſtic fluids are ſuſceptible of what may be termed *internal motion;* a kind of undulation, where the contiguous parts are thrown into tremulous vibrations, in which they are alternately condenſed and rarefied; and theſe undulations are propagated along the maſs of elaſtic fluid, much in the ſame way in which we obſerve waves to ſpread on the ſurface of water. What makes this an intereſting ſubject of conſideration is, that theſe undulations are the more ordinary cauſes of ſound. A trembling chord, or ſpring, or bell, agitates the air adjoining to it: theſe agitations are propagated along the air, and by its intervention agitate the organ of hearing. The mechaniſm of theſe undulations has been much ſtudied, and furniſhes a very beautiful theory of muſical harmony.

69 Of the compreſſibility of elaſtic fluids, and its conſequences.

The philoſopher examines the *law of compreſſibility* of air and other elaſtic fluids; and thus gets the knowledge of the conſtitution of the atmoſphere, and of the action of thoſe fluids when employed to impel ſolid bodies. Gunpowder contains an immenſe quantity of permanently elaſtic air, which may be ſet at liberty by inflammation. When this is done at the bottom of a piece of ordnance, it will impel a ball along the barrel, and diſcharge it from the muzzle, in the ſame way that an arrow is impelled by a bow. And thus having diſcovered in what degree this air preſſes in proportion to its expanſion, we diſcover its action on the ball through the whole length of the piece, and the velocity which it will finally communicate to it. Here then is contained a theory of artillery and of mines.

70 Of the converſion of bodies into elaſtic fluids by fire.

Chemiſtry teaches us, that moſt bodies can be converted by fire into elaſtic fluids, which can be employed to act on other bodies in the way of preſſure or impulſe. Thus they come under the review of the mechanical philoſopher; and they have become intereſting by being employed as moving forces in ſome very powerful machines.

Theſe diſcuſſions will nearly exhauſt all the general mechanical phenomena. There remain ſome which are much more limited, but furniſh very curious and important ſubjects of inveſtigation.

71 Of the phenomena of loadſtone, or magnetiſm.

The phenomena exhibited between loadſtones or magnets and iron have long attracted attention; and the uſe to which the polarity of the loadſtone has been applied, namely, the directing the courſe of a ſhip through the pathleſs ocean, has rendered theſe phenomena extremely intereſting. They are ſpecified by the term MAGNETISM. Conſiderable progreſs has been made in the arrangement and generalization of them; but we have by no means been able hitherto to bring them all under one ſimple fact. The attention has been too much turned to the diſcovery of the ultimate cauſe of magnetiſm; whereas we ſhould have rather employed our ingenuity in diſcovering all the general laws, in the ſame manner as Kepler and Newton did with reſpect to the celeſtial phenomena, without troubling themſelves with the cauſe of gravitation. Dr Gilbert of Colcheſter was the firſt who conſidered the magnetical phenomena in the truly philoſophical manner; and his treatiſe *De Magnete* may be conſidered as the firſt and one of the moſt perfect ſpecimens of the Baconian or inductive logic. It is indeed an excellent performance; and when we conſider its date, 1580, it is a wonder. Æpinus's *Tentamen Theoriæ Magnetiſmi* is a moſt valuable work, and contains all the knowledge which we have as yet of the ſubject.

72 Of electrical phenomena.

There is another claſs of mechanical phenomena which have a conſiderable affinity with the magnetical; we mean the phenomena called ELECTRICAL. Certain bodies, when rubbed or otherwiſe treated, attract and repel other bodies, and occaſion a great variety of ſenſible motions in the neighbouring bodies. Philoſophers have paid much attention to theſe appearances of late years, and eſtabliſhed many general laws concerning them. But we have not been more ſucceſsful in bringing them all under one fact, and thus eſtabliſhing a complete theory of them, than in the caſe of magnetiſm. Franklin and Æpinus are the authors who have been moſt ſucceſsful in this reſpect. Dr Franklin in particular has acquired great celebrity by his moſt ſagacious compariſon of the phenomena; which has enabled him to eſtabliſh a few general laws, almoſt as preciſe as thoſe of Kepler, and of equally extenſive influence. His diſcovery too of the identity of thunder and electricity has given an importance and dignity to the whole ſubject.

73 Theſe are not all mechanical.

There are many phenomena of electricity which cannot be called mechanical, and are of the moſt curious and intereſting kind. As theſe have little connection with any of the other great branches of phyſical ſcience, they have generally been conſidered in treatiſes of natural philoſophy; and, along with inquiries into the original cauſe of electricity in general, continue to engage much of our attention.

The appearances which are preſented to us by our

ſenſe of ſeeing form another claſs, which have always been conſidered as making a branch of natural philoſophy in all ſeminaries of learning. It does not, however, obviouſly appear, that they are mechanical phenomena. The intimate nature of light is ſtill a ſecret. Fortunately it is not neceſſary to be known to give us a very perfect theory of the chief phenomena. The general laws of optics are ſo few, ſo ſimple, and ſo preciſe, that our theories are perhaps more perfect here than in any other branch of phyſics; but theſe theories are as yet far removed from the rank of primary facts. Many unknown events happen before the phenomenon comes under the hands of the ordinary optician, ſo as to become the ſubjects of the ſimple laws of reflection and refraction.

74 Of the phenomena of viſion.

75 It has been doubted whether light is corporeal.

It may even be doubted, and has been doubted, whether the phenomena of optics are caſes of body in motion; whether all the lines which the optician draws are any thing but the directions along which certain *qualities* are exerted. The ſide of a ball which is next the candle may be bright and the other ſide dark, juſt as the ſide of a ball which is next the electrical globe is *minus* and the other ſide *plus*; and all this without any intervening medium. Apparition or viſibility may be a quality of a body, depending on the proximity and poſition of another body, without any thing between them, juſt as weight is; and this quality may be cognizable by our faculty of ſeeing alone, juſt as the preſſure of a heavy body is by our feeling alone.

76 How optics came to be conſidered as a part of mechanical philoſophy.

The firſt thing which made it probable that mechanical philoſophy had any thing to do with the phenomena of optics, was the diſcovery of Mr Roemer, "that apparition was not inſtantaneous;" that ſome time elapſed between the illumination of a body and its being ſeen at a diſtance. He diſcovered, that it was not till 40 minutes after the ſun illuminated one of Jupiter's ſatellites that it was ſeen by the inhabitants of this globe. If therefore a ſun were juſt created, it would be 40 minutes before Jupiter would be illuminated by him, and 200 before the Georgian planet would be illuminated. Here then is motion.

77 The nature of light is ſtill undetermined.

It is therefore highly probable that there is ſomething moved; but it is ſtill doubted whether this ſomething, which we call LIGHT, is a matter emitted from the ſhining body, and moving with great velocity, and acting on and affected by other bodies, in the various phenomena of optics, or whether it is a *certain ſtate* of a medium which is thus propagated, as we ſee that waves are propagated along the ſurface of water, or ſonorous undulations through the maſs of air, while the water or air itſelf is hardly moved out of its place. Either of theſe ſuppoſitions makes optics a legitimate branch of mechanical philoſophy; and it is the philoſopher's buſineſs to examine both by the received laws of motion, and ſee which of them gives conſequences which tally with the phenomena. This has been done; and we imagine that a complete incompatibility has been demonſtrated between the conſequences of the undulations of an elaſtic medium, and the phenomena of optics; while the conſequences of the other or vulgar notion on this ſubject are perfectly conſiſtent with mechanical laws. There are ſome things in this hypotheſis very far beyond our power to conceive diſtinctly; but they are all ſimilar in this reſpect to many facts acknowledged by all; and there is no phenomenon that is inconſiſtent with the legitimate conſequences of the hypotheſis. This gives it great probability; and this probability is confirmed by many chemical facts, and by facts in the vegetable economy, which give ſtrong and almoſt undeniable indications of light being a body capable of a chemical union with the other ingredients of ſublunary bodies, and of being afterwards ſet at liberty under its own form, as the cauſe or medium of viſion.

78 But this does not affect the ſcience of optics.

But theſe are queſtions ſimilar to thoſe about the cauſe of gravity, and totally unneceſſary for eſtabliſhing a complete theory of the optical phenomena, for explaining the nature of viſion, the effects of optical inſtruments, the cauſe of colours, the phenomena of the rainbow, halos and parhelia, &c. &c. &c. Only all this theory is unconnected with the principles called mechanical.

79 The probable increaſe of the above extenſive field of obſervation.

Such is the field of obſervation to the mechanical philoſopher of the preſent day. We may hope to extend it, and by degrees apply its doctrines even to the unſeen motions which take place in chemiſtry and phyſiology. But we muſt, in the firſt place, perfect our knowledge and deſcription of the ſenſible motions and actions of bodies. Thoſe of fluids ſtill demand much inveſtigation; and till theſe are thoroughly underſtood, it is not time to attempt penetrating further into the receſſes of nature.

80 Inveſtigation of the law that action is always equal and oppoſite to reaction.

In the proſecution of this ſtudy, it is found that every change which can be obſerved in the ſtate of a body, with reſpect to motion by the action of another body, is accompanied by an equal and oppoſite change in the ſtate of that other body. Thus, in the phenomena of gravitation, it is obſerved that the deflections of the ſun and planets are mutual. The ſame thing is obſerved in the actions of magnets on each other and on iron; it is alſo obſerved in the attractions and repulſions of electrical bodies; and it alſo obtains in all the phenomena of impulſe and of corporeal preſſure. It is therefore an univerſal law of motion, that *action is always equal and oppoſite to reaction*: but this muſt be conſidered merely as a matter of fact, a contingent law of nature, like that of gravitation. The contrary is perfectly conceivable, and involves no contradiction. That this is ſo, is evident from the proceedings of philoſophers, who in every new caſe make it their buſineſs to diſcover by experiment whether this law was obſerved or not. It was among the laſt diſcoveries made by Sir Iſaac Newton in his examination of the celeſtial motions. This being the caſe, it ſhould never be aſſumed as a principle of reaſoning till its operation has been aſcertained by obſervation.

81 The term *inertia* has occaſioned much wrangling and miſconception on this ſubject.

It has been owing to this improper procedure that much falſe reaſoning has been introduced into mechanical philoſophy, and particularly into the theory of impulſion or the communication of motion by impulſe. In conſidering this ſubject, a term has been introduced which has occaſioned much wrangling and miſconception; we mean the term INERTIA. It ſerves indeed to abbreviate language, but it has often miſled the judgment. When uſed with cautious attention to every circumſtance, it expreſſes nothing but the neceſſity of a cauſe to the production of any effect: but it is generally uſed as expreſſing a quality inherent in matter, by which it *reſiſts* any change of ſtate, or by which it maintains its preſent ſtate. Matter is ſaid to be inert; and as every thing which changes the motion of a body is called a *force*, and as this inertia of A is ſuppoſed to change the motion of B, it is called *vis inertiæ*; and yet matter is ſaid to be indifferent as to motion or reſt, and to be inactive. Theſe

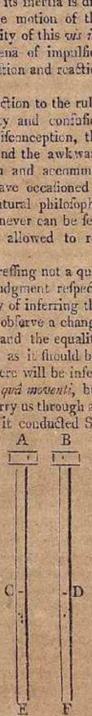
are

are surely very incongruous expressions. This obscure discourse has arisen from the poverty of all languages, which are deficient in original terms, and therefore employ figurative ones. Force, action, resistance, are all appropriated terms related to our own exertions; and some resemblance between the external effects of these exertions and the effects of the connecting qualities of natural bodies, has made us use them in our disquisitions on these subjects. And as we are conscious that, in order to prevent our being pushed by another from our place, we must resist, exerting force; and that our resistance is the reason why this other man has not accomplished his purpose, we say, that the quiescent body resists being put in motion, and that its inertia is discovered by the diminution made in the motion of the impelling body: and upon the authority of this *vis inertiæ* as a first principle, the phenomena of impulsion are explained, and the law of equal action and reaction is established.

But all this procedure is in contradiction to the rules of inductive logic; and the obscurity and confusion which has arisen from this original misconception, the consequent incongruity of language, and the awkward attempts that have been made to botch and accommodate it to the real state of things, have occasioned a dispute, and the only dispute, in natural philosophy which has not yet been settled, and never can be settled, while such misconceptions are allowed to remain.

82 Its proper meaning, with an example.

If the word *inertia* be taken as expressing not a quality of matter, but a law of human judgment respecting matter, as expressing our necessity of inferring the agency of a moving force whenever we observe a change of motion, all difficulties will vanish, and the equality of action and reaction will be inferred, as it should be, from the phenomena of collision. There will be inferred a *vis insita corpori impellenti*, not *quâ moventi*, but *quâ corpori*; and this inference will carry us through all the mysteries of corporeal action, as it conducted Sir Isaac Newton in his grand researches.



Let us just consider how we reason in a new case. Let A and B be two magnets fastened on the ends of two long wooden laths AE, BF, which turn horizontally on pivots C, D, like compass needles, with their north poles fronting each other, 12 inches apart; and let A be pushed towards B, so that it would move uniformly with the velocity of two inches in a second. The phenomena *which have been observed* are as follow: A will gradually diminish its velocity; and when it has advanced about nine inches, will stop completely. B, in the mean time will gradually acquire motion; and when it has advanced about nine inches, will have a velocity of about two inches per second, with which it will continue to move uniformly. Now what is inferred from these phenomena? Because the motion of A is gradually retarded, we infer that a retarding force, that is, a force in the direction BA, has acted on it. And since this would not have happened if B had not been there, and always happens when B is there, we infer that B is either its cause or the occasion of its action. The vulgar say that B repels A; so say the dynamists. The abettors of invisible fluids say, that a stream of fluid issuing from B impels A in the opposite direction. All naturalists agree in saying, that an active force connected with B has destroyed the motion of A, and consider this curious phenomenon as the indication and characteristic of a discovery. The same inference is made from the motion produced in B: it is considered by all as effected by a force exerted or occasioned by the presence of A; and the dynamists and the vulgar say that A *repels* B. And both parties conclude, from the equal changes made on both bodies, that the changing forces are equal; here acknowledging, that they *observe* an equality of action and reaction; and they add this to the other instances of the extent of this law of motion.

All this while no one thinks of the inertia or inactivity of B, but, on the contrary, conclude this to be a curious instance of its activity; and most people conclude that both bodies carry about with them a *vis insita* both when at rest and when in motion.

83 It is doubtful whether actual contact has ever been observed.

If other phenomena give unquestionable evidence that, in ordinary collisions, there is the same changes of motion, produced without mathematical contact, the same inferences must be drawn; and a scrupulous naturalist will doubt whether contact should make any change in our reasonings on the subject, and whether actual contact ever has been or can be observed. He will also be convinced, that while this is the general, or perhaps universal, process of nature in producing motion by impulse, all explanations of the action of bodies *è distanti*, by the intervention of ethers and other invisible fluids, are nothing but multiplying the difficulties; for in place of one fact, the approach of one magnet (for instance) to another, they substitute millions of unseen impulses, each of which equally needs an explanation. And if this fluid be supposed to produce its effects by any *peculiarity* in its constitution, as in the case of Newton's elastic ether proposed by him to explain gravitation, the hypothesis substitutes, in the most unqualified manner, millions of similar phenomena for the one to be explained; for there is the same want of a second fluid in order to produce that mutual recess of the particles of the ether which constitutes its elasticity.

84 The folly of supposing intervening ethers, &c.

85 The quality of bodies whereby they affect other bodies is inscrutable by us.

And this seems to be the limit to our inquiries into all the classes of natural phenomena. We find the masses or the particles of matter endued in fact with qualities which affect the state of other particles or masses, at smaller or at greater distances from each other according to certain general rules or laws. This ultimate step in the constitution of things is inscrutable by us. It is arrogance in the highest degree for us to say, that because we do not comprehend how there is inherent in a body any quality by which another body may be affected at any distance from it, therefore no such quality *is possible*. It is no less so to say, that matter has no active property but that of moving other matter by impulse; and that because it may be so moved, and also by the agency of our own minds, therefore, when it is not moved by impulse, it is moved by minds. The same almighty FIAT which brought a particle of matter into existence could bring those qualities equally into existence; and the *how* in both is equally beyond our comprehension.

86 This should not, however, stop further inquiries.

But, on the other hand, we must guard against the incurious resting on this consideration as a stop to further inquiry. There may be species of matter possessed

Mechanical Philosophy.

sed of the mechanical powers, and which notwithstanding is not cognisable by our senses. All the properties of matter are not known to a person who is both deaf and blind; and beings possessed of more senses may perceive matter where we do not; and many phonomena may really be produced by the action of intervening matter, which we, from indolence or from haste, ascribe to the agency of inherent forces. The industry of philosophers has already discovered intermedia in some cases. It is now certain that air is the conveyor of sound, and it is almost certain that there is such a thing as light. Let us therefore indulge conjectures of this kind, and examine the conjectures by the received laws of motion, and reject them when we find the smallest inconsistency; and always keep in mind that even the most coincident with the phenomena is still but a possibility.

87
These observations are not physical, but metaphysical.

We may conclude the whole of these observations with the remark, that these questions about the activity or inactivity of matter are not physical, but metaphysical. Natural philosophy, it is true, commonly takes it for granted that matter is wholly inactive; but it is not of any moment in physics whether this opinion be true or false; whether matter be acted on according to certain laws, or whether it act of itself according to the same laws, makes no difference to the natural philosopher. It is his business to discover the laws which really obtain, and to apply these to the solution of subordinate phenomena; but whether these laws arise from the nature of some agent external to matter, or whether matter itself is the agent, are questions which may be above his comprehension, and do not immediately concern his proper business.

88
The above account points out the best method of study.

The account we have now given of natural philosophy points out to us in the plainest manner the way in which the study must be prosecuted, and the helps which must be taken from other branches of human knowledge.

89
This method further explained and exemplified.

The causes, powers, forces, or by whatever name we choose to express them, which produce the mechanical phenomena of the universe, are not observed, and are known to us only in the phenomena themselves. Our knowledge of the mechanical powers of nature must therefore keep pace with our knowledge of the motions, and indeed is nothing different from it. In order to discover and determine the forces by which the moon is retained in her orbit round the earth, we must know her motions. To a terrestrial spectator she appears to describe an ellipse, having the earth in one focus; but, in the mean time, the earth is carried round the sun, and the moon's real path, in absolute space, is a much more complicated figure. Till we know this figure, and the variations in the velocity with which it is described, we know nothing of the forces which actuate the moon in her orbit.

90
The meaning of some terms used in speaking of the celestial motions.

When Newton says that the forces by which she is retained in this elliptical orbit are directed to the earth, what does he mean? Only this, that the deflections from that uniform rectilineal motion which she would otherwise have performed are always in this direction. In like manner, when he says that these forces are inversely proportionate to the squares of her distances from the earth, he only means that the deflections made in equal times in different parts of her motion are in this proportion. These deflections are considered as the characteristics and measures of the forces. We imagine that we have made all plain when we call this indicated cause a *tendency* to the earth; but we have no notion of this tendency to the earth different from the approach itself. This word tendency, so fashionable among the followers of Sir Isaac Newton, is perverted from its pure and original sense. *Tendere versus solem*, is, in the language of Rome and also of Newton, *to go* towards the sun; but we now use the words *tend, tendency*, to signify, not the *approach*, but the *cause* of this approach. And when called upon to speak still plainer, we desert the safe paths of plain language, and we express ourselves by metaphor; speaking of *nisus, conatus sese mutuo accedende, vis centripeta*, &c. When these expressions have become familiar, the original sense of the word is forgotten, and we take it for granted that the words never had another meaning; and this metaphor, sprung from the poverty of language, becomes a fruitful source of misconception and mistake. The only way to secure ourselves against such mystical notions as are introduced by these means into philosophy, is to have recourse to the way in which we acquire the knwledge of these fancied powers; and then we see that their names are only names for phenomena, and that universal gravitation is only an universal mutual approach among the parts of the solar system.

91
The absurdity of reasoning à priori.

There is one case in which we fondly imagine that we know the cause independent of the effect, and that we could have predicted the phenomenon *à priori*; we mean the case of impulse: and hence it is that we are so prone to reduce every thing to cases of impulsion, and that we have fallen upon all these subterfuges of ethers and other subtile fluids. But we might have saved ourselves all this trouble; for after having, by much false reasoning and gratuitous assumptions, shown that the phenomenon in question *might have been produced* by impulse, we are no nearer our purpose, because that property by which matter in motion puts other matter in motion, is known to us only *by* and *in* the effect.

92
We know nothing of the immediate causes of motions except by a knowledge of the motions themselves.

The fair and logical deduction from all this is, that we must not expect any knowledge of the powers of nature, the immediate causes of the motions of bodies, but by means of a knowledge of the motions themselves; and that every mistake in the motions is accompanied by a similar mistake in the causes. It is impossible to demonstrate or explain the gravitation of the planets to him who is ignorant of the properties of the ellipse, or the theory of gunnery to him who does not know the parabola.

93
A man cannot be a good natural philosopher without being a mathematician.

A notion has of late gained ground, that a man may become a natural philosopher without mathematical knowledge; but this is entertained by none who have any mathematics themselves; and surely those who are ignorant of mathematics should not be sustained as judges in this matter. We need only appeal to fact. It is only in those parts of natural philosophy which have been mathematically treated, that the investigations have been carried on with certainty, success, and utility. Without this guide, we must expect nothing but a school-boy's knowledge, resembling that of the man who takes up his religious creed on the authority of his priest, and can neither give a reason for what he imagines that he believes,

lieves, nor apply it with confidence to any valuable purpose in life. We may read and be amused with the trifling or vague writings of a Nollet, a Ferguson, or a Priestley; but we shall not understand, or profit by the truths communicated by a Newton, a D'Alembert, or De la Grange.

These observations, on the other hand, show us the nature of the knowledge which may be acquired, and the rank which natural philosophy holds among the sciences.

94 The motions of bodies, the only objects of observation, are subjects of pure mathematical disquisition.

Motions are the real and only objects of our observation, the only subjects of our discussion. In motion are included no ideas but those of space and time, the subjects of pure mathematical disquisition. As soon, therefore, as we have discovered the fact, the motion, all our future reasonings about this motion are purely mathematical, depending only on the affections of figure, number, and proportion, and must carry along with them that demonstration and irresistible evidence which is the boast of that science. To this are we indebted for that accuracy which is attained, and the progress which has been made in some branches of mechanical philosophy; for when the motions are distinctly and minutely understood, and then considered only as mathematical quantities, independent of all physical considerations, and we proceed according to the just rules of mathematical reasoning, we need not fear any intricacy of combination or multiplicity of steps; we are certain that truth will accompany us, even though we do not always attend to it, and will emerge in our final proposition, in the same manner as we see happen in a long intricate algebraic analysis.

95 Mechanical philosophy thus cultivated is a demonstrative science.

Mechanical philosophy, therefore, which is cultivated in this way, is not a system of probable opinions, but a *disciplina accurata*, a demonstrative science. To possess it, however, in this form, requires considerable preparation. The mere elements of geometry and algebra are by no means sufficient. Newton could not have proceeded *sine "sua mathesi facem preferente;"* and, in creating a new science of physics, he was obliged to search for and discover a new source of mathematical knowledge.

96 The lamentable decay of mathematics in Britain,

It is to be lamented that the taste for the mathematical sciences has so prodigiously declined in this country of late years; and that Britain, which formerly took the lead in natural philosophy, should now be the country where they are least cultivated. Few among us know more than a few elementary doctrines of equilibrium: while, on the continent, we find many authors who cultivate the Newtonian philosophy with great assiduity and success, and whose writings are consulted as the fountains of knowledge by all our countrymen who have occasion to employ the discoveries in natural philosophy in the arts of life. It is to the foreign writers that we have recourse in our seminaries, even for elementary treatises; and while the continent has supplied us with most elaborate and useful treatises on various articles, in physical astronomy, practical mechanics, hydraulics, and optics, there has not appeared in Britain half a dozen treatises worth consulting for these last forty years; and this notwithstanding the unparalleled munificence of our present sovereign, who has given more liberal patronage to the cultivators of mathematical philosophy, and indeed of science in general, than any prince in Europe.

97 notwithstanding the amplest encouragement from the crown.

The magnificent establishments of Louis XIV. originated from his insatiable ambition and desire of universal influence, directed by the sagacious Colbert. And his patronage being exerted according to a regular plan in the establishment of pensioned academies, and in procuring the combined efforts of the *most eminent* of all countries, his exertions made a conspicuous figure, and filled all Europe with his eulogists. But all this was done without the smallest self-denial, or retrenchment of his own pleasures, the expences being furnished out of the public revenues of a great and oppressed nation; whereas the voyages of discovery, the expensive observations and geodetical operations in Britain, and the numberless unheard-of pensions and encouragements given to men of science and activity, were all furnished out of the private estate of our excellent sovereign, who seems to delight in repaying, by every service in his power, the attachment of a loyal and happy nation. It is therefore devoutly to be wished that his patriotic efforts were properly seconded by those whom they are intended to serve, and that the taste for the mathematical sciences may again turn the eyes of Europe to this country for instruction and improvement. The present seems a most favourable era, while the amazing advances in manufactures of every kind seem to call aloud for the assistance of the philosopher. What pleasure would it have given to Newton or Halley to have seconded the ingenious efforts of a Watt, a Boulton, a Smeaton, an Arkwright, a Dollond? and how mortifying is it to see them indebted to the services of a Belidor, a Bossut, a Clairaut, a Boscovich?

We hope to be pardoned for this digression, and return to our subject.

98 Mechanical philosophy is almost wholly a mathematical study.

It appears from what has been said, that mechanical philosophy is almost wholly a mathematical study, and that it is to be successfully prosecuted only under this form: but in our endeavours to initiate the young beginner, it will be often found to require more steadiness of thought than can generally be expected for keeping the mind engaged in such abstract speculations. The object presented to the mind is not readily apprehended with that vivacity which is necessary for enabling us to reason upon it with clearness and steadiness, and it would be very desirable to have some means of rendering the conception more easy, and the attention more lively.

99 Experiments are, however, necessary to insure the attention of young minds.

This may be done by exhibiting to the eye an experiment, which, though but a single fact, gives us a sensible object of perception, which we can contemplate and remember with much more steadiness than any mere creature of the imagination. We could, by an accurate description, give such a conception of a room that the hearer should perfectly comprehend our narration of any occurrence in it: but one moment's glance at the room would be infinitely better. It is usual therefore to employ experiments to assist the imagination of the beginner; and most courses of natural philosophy are accompanied by a series of such experiments. Such experiments, connected by a slight train of argumentative discourse, may even serve to give a notion of the general doctrines, sufficient for an elegant amusement, and even tending to excite curiosity and engage in a serious prosecution of the study. Such are the usual courses which go by the name of experimental philosophy: but this is

Experimental Philosophy. is a great misapplication of the term; such courses are little more than *illustrations* of known doctrines by experiments.

100 Experimental philosophy defined and explained.

Experimental Philosophy is the investigation of general laws, as yet unknown, by experiment; and it has been observed, under the article Philosophy, that this is the most infallible (and indeed the sole) way of arriving at the knowledge of them. This is the *Novum Organum Scientiarum* strongly recommended by Lord Bacon. It was new in his time, though not altogether without example; for it is the procedure of nature, and is followed whenever curiosity is excited. There was even extant in his time a very beautiful example of this method, viz. the Treatise of the Loadstone, by Dr Gilbert of Colchester; a work which has hardly been excelled by any, and which, when we consider its date, about the year 1580, is really a wonderful performance.

The most perfect model of this method is the Optics of Sir Isaac Newton. Dr Black's Essay on Magnesia is another very perfect example. Dr Franklin's Theory of Electricity is another example of great merit. That the investigation is not complete, nor the conclusions certain, is not an objection. The method is without fault; and a proper direction is given to the mind for the experiments which are still necessary for establishing the general laws.

101 A good treatise on the method of inquiry by experiment very necessary.

It were much to be wished that some person of talents and of extensive knowledge would give a treatise on the method of inquiry by experiment. Although many beautiful and successful examples have been given as particular branches of inquiry, we have but too many instances of very inaccurate and inconclusive investigations. Experiments made at random, almost without a view, serve but little to advance our knowledge. They are like shapeless lumps of stone merely detached from the rock, but still wanting the skill of the builder to select them for the different purposes which they may chance to serve; while well contrived experiments are blocks cut out by a skilful workman, according as the quarry could furnish them, and of forms suited to certain determined uses in the future edifice. Every little series of experiments by Margraaf terminates in a general law, while hardly any general conclusion can be drawn from the numberless experiments of Pott. Lord Bacon has written much on this subject, and with great judgment and acuteness of distinction; but he has exceeded in this, and has fatigued his readers by his numerous rules; and there is in all his philosophical works, and particularly in this, a quaintness and affectation that greatly obscure his meaning, so that this most valuable part of his writings is very little read.

102 An objection to experimental inquiry.

A formidable objection has been made to this method of inquiry. Since a physical law is only the expression of a general fact, and is established only in consequence of our having observed a similarity in a great number of particular facts; and since the great rule of inductive logic is to give the law no greater extent than the induction on which it is founded—how comes it that a few experiments must be received as the foundation of a general inference? This has been answered in very general terms in the article Philosophy. But it will be of use to consider the subject a little more particularly. Our observations on this subject are taken from the dissertation on evidence by Dr Campbell in his Philosophy of Rhetoric.

103 The objection answered, with examples showing the nature and certainty of this mode of inquiry.

An attentive consideration of the objects around us, will inform us that they are generally of a complicated nature, not only as consisting of a complication of those qualities of things called accidents, such as gravity, mobility, colour, figure, solidity, which are common to all bodies; but also as consisting of a mixture of a variety of substances, very different in their nature and properties; and each of these is perhaps compounded of ingredients more simple.

Moreover, the farther we advance in the knowledge of nature, we find the more reason to be convinced of her constancy in all her operations. Like causes have always produced like effects, and like effects have always been preceded by like causes. Inconstancy sometimes appears in Nature's works at *first sight*; but a more refined experience shows us that this is but an appearance, and that there is no inconstancy: and we explain it to our satisfaction in this way.

Most of the objects being of a complicated nature, we find, on an accurate scrutiny, that the effects ascribed to them ought often to be solely ascribed to one or more of these component parts, while the others either do not contribute to them, or hinder their production; and the variety of nature is so great, that hardly any two individuals of the same species are in every respect like any other. On all these accounts we expect dissimilitudes in the phenomena accompanying perfectly similar treatment of different subjects of the same kind; but we find, that whenever we can be assured that the two substances are perfectly alike, the phenomena arising from similar treatment are the same: and long and extensive observation teaches us, that there are certain circumstances which insure us in the perfect similarity of constitution of some things. Whenever we observe the effect of any natural agent on one, and but one, of these, we invariably expect that the same will be produced on any other.

Should a botanist meet with a plant new to him, and observe that it has seven monopetalous flowers, he will conclude with the utmost confidence that every plant of this species will have monopetalous flowers; but he will not suppose that it will have seven, and no more than seven, flowers. Now these two facts seem to have no difference to warrant such a difference in the conclusion; which may therefore seem capricious, since there is but one example of both.

But it is not from this example only that he draws the conclusion. Had he never before taken notice of any plant, he would not have reasoned at all from these remarks. But his mind runs immediately from this unknown species to all the known species of this genus, and to all the genera of the same order; and having experienced in the *figure* of the flower an uniformity in every species, genus, and order, which admits of no exception, but, in the *number* of flowers, a variety as boundless as are the circumstances of soil, climate, age, and culture, he learns to mark the difference, and draws the above-mentioned conclusions. Thus we learn, that *perfect* uniformity is not to be expected in any instance whatever, because in no instance is the simplicity of constitution sufficiently great to give us assurance of perfect uniformity in the circumstances of the case; and the ut- most

Experimental Philosophy.

moſt that our experience can teach us is a quick diſcrimination of thoſe circumſtances which produce the occaſional varieties.

The nearer that our inveſtigations carry us to the knowledge of *elementary* natures, the more are we convinced by general experience of the uniformity of the operations of real elements; and although it may perhaps be impoſſible for us ever to arrive at the knowledge of the ſimpleſt elements of any body, yet when any thing *appears* ſimple, or rather ſo exactly uniform, as that we have invariably obſerved it to produce ſimilar effects, on diſcovering any *new* effect of this ſubſtance, we conclude, from a general experience of the efficient, a like conſtancy in the energy as to the reſt. Fire conſumes wood, melts lead, and hardens clay. In theſe inſtances it acts uniformly, but not in theſe only. We have always found, that whatever of any ſpecies is conſumed by it in one inſtance, has been conſumed by it on trial at any time. If therefore a trial be made for the firſt time of its influence on any particular ſubſtance, he who makes it is warranted to conclude that the effect, whatever it may be, is a faithful repreſentative of its effects on this ſubſtance in all paſt and future ages. This concluſion is not founded on this ſingle inſtance, but upon this inſtance combined with the general experience of the regularity of this element in its operations.

This general concluſion, therefore, drawn from one experiment, is by no means in oppoſition to the great rule of inductive logic, but, on the contrary, it is the moſt general and refined application of it. General laws are here the real ſubject of conſideration; and a law ſtill more general, viz. *that nature is conſtant in all its operations*, is the inference which is here applied as a principle of explanation of a phenomenon which is itſelf a general law, viz. *that nature is conſtant in this operation.*

The foundation of this general inference from one experiment being ſo firmly eſtabliſhed, it is evident that experiments muſt be an infallible method of attaining to the knowledge of nature; and we need only be ſolicitous that we proceed in a way agreeable to the great rule of inductive logic; that is, the ſubject muſt be cleared of every accidental and *unknown* circumſtance, and put into a ſituation that will reduce the intereſting circumſtance to a ſtate of the greateſt poſſible ſimplicity. Thus we may be certain that the event will be a faithful repreſentative of every ſimilar caſe: and unleſs this be done in the preparation, nothing can reſult from the moſt numerous experiments but uncertainty and miſtakes.

104 Mathematics do not ſuperſede the uſe of experiment.

The account which has been given of mechanical philoſophy would ſeem to indicate that experiment was not of much uſe in the farther proſecution of it. The two laws of motion, with the aſſiſtance of mathematics, ſeem fully adequate to the explanation of every phenomenon: and ſo they are to a *certain degree.* But this degree is as yet very limited. Our mathematical knowledge, great as it is in compariſon with that of former times, is ſtill inſufficient for giving accurate ſolutions even of very ſimple (comparatively ſpeaking) queſtions. We can tell, with the utmoſt preciſion, what will be the motions of two particles of matter, or two bodies, which act on each other with forces proportioned to the ſquares of the diſtances inverſely; but if we add a third particle, or a third body, acting by the ſame law, the united ſcience of all Europe can only give an approximation to the ſolution.

105 Experiment is often the only reſource.

What is to be done then in the caſes which come continually before us, where millions of particles are acting at once on each other in every variety of ſituation and diſtance? How ſhall we determine, for inſtance, the motion of water through a pipe or ſluice when urged by a piſton or by its own weight? what will be its velocity and direction? It is impoſſible, in the preſent ſtate of mathematical knowledge, to tell with any preciſion or certainty. And here we muſt have recourſe to experiment. But if this be the caſe, muſt the experiment be made in every poſſible variety of ſituation, depth, figure, preſſure? or is it poſſible to find out any general rules, founded on the general laws of motion, and rationally deduced from them? Or, if this cannot be accompliſhed, will experiment itſelf furniſh any general coincidences which ſhow ſuch mutual dependences, that we may conſider them as indications of general principles, though ſubordinate, complicated, and perhaps inſcrutable? This can be diſcovered by experiment alone.

106 Accurate experiments cannot always be made.

The attention of philoſophers has been directed to each of theſe three chances, and conſiderable progreſs has been made in them all. Numerous experiments have been made, almoſt ſufficient to direct the practice in many important caſes, without the help of any rule or principle whatever. But there are many caſes, and theſe of by far the greateſt importance, ſuch as the motion of a ſhip impelled by the winds, reſiſted by the water, and toſſed by the waves, where diſtinct experiments cannot be made.

107 Example of the neceſſity of experiment.

Newton, Bernouilli, d'Alembert, and others, have laboured hard to deduce from the laws of motion rules for determining what may be called the *average* motion of water in theſe circumſtances, without attempting to define the path or motion of any individual particle; and they have actually deduced many rules which have a great degree of probability. It may here be aſked, why do you ſay *probability?* the rules, as far as they go, ſhould be *certain.* So they are; they are ſtrict deductions from their premiſſes. But the premiſſes are only *ſuppoſitions*, of various degrees of probability, aſſumed in order to ſimplify the circumſtances of the caſe, and to give room for mathematical reaſoning; therefore theſe deductions, theſe rules, muſt be examined by experiment. Some of the ſuppoſitions are ſuch as can hardly be refuſed, and the rules deduced from them are found to tally preciſely with the phenomena. Such is this, "that the velocities of iſſuing water in ſimilar circumſtances are in the ſub-duplicate ratio of the preſſures." And this rule gives a moſt important and extenſive information to the engineer. Other ſuppoſitions are more gratuitous, and the rules deduced from them are leſs coincident with the phenomena. The patient and ſagacious Newton has repeatedly failed in his attempts to determine what is the *abſolute velocity* of water iſſuing from a hole in the bottom of a veſſel when urged by its weight alone, and the attempts of the others have hardly ſucceeded better. Experiment is therefore abſolutely neceſſary on this head.

Thoſe who have aimed at the diſcovery of *rules* purely experimental on this ſubject, have alſo been pretty ſucceſsful; and the Chevalier Buat has, from a compariſon

Experimental Philosophy. ſon of an immenſe variety of experiments made by himſelf and various authors, deduced an empirical rule, which will not be found to deviate from truth above one part in ten in any caſe which has yet come to our knowledge.

This inſtance may ſerve to ſhow the uſe of experiments in mechanical philoſophy. It is proper in all caſes by way of illuſtration; and it is abſolutely neceſſary in moſt, either as the foundation of a characteriſtic of a particular claſs of phenomena, or as argument in ſupport of a particular doctrine. Hydroſtatics, hydraulics, pneumatics, magnetiſm, electricity, and optics, can hardly be ſtudied in any other way; and they are at preſent in an imperfect ſtate, and receiving continual improvement by the labours of experimental philoſophers in all quarters of the world.

108 The advantages derived from the ſtudy of philoſophy

Having in the preceding paragraphs given a pretty full enumeration of the different ſubjects which are to be conſidered in the ſtudy of natural philoſophy, it will not be neceſſary to ſpend much time in a detail of the advantages which may reaſonably be expected from a ſucceſsful proſecution of this ſtudy. It ſtands in no need of panegyric: its intimate connection with the arts gives it a ſufficient recommendation to the attention of every perſon. It is the foundation of many arts, and it gives liberal aſſiſtance to all. Indebted to them for its origin and birth, it has ever retained its filial attachment, and repaid all their favours with the moſt partial affection.

109 in navigation,

To this ſcience the navigator muſt have recourſe for that aſtronomical knowledge which enables him to find his place in the trackleſs ocean; and although very ſmall ſcraps of this knowledge are ſufficient for the mere pilot, it is neceſſary that the ſtudy be proſecuted to the utmoſt by ſome perſons, that the unlearned pilot may get that ſcanty pittance which muſt direct his routine. The few pages of tables of the ſun's declination, which he uſes every day to find his latitude, required the ſucceſſive and united labours of all the aſtronomers of Europe to make them tolerably exact: and in order to aſcertain his longitude with preciſion, it required all the genius of a Newton to detect the lunar irregularities, and bring them within the power of the calculator; and, till this was done, the reſpective poſition of the different parts of the earth could not be aſcertained. Vain would have been the attempt to do this by geodœtical ſurveys independent of aſtronomical obſervation. It is only from the moſt refined mechanics that we can hope for ſure principles to direct us in the conſtruction and management of a ſhip, the boaſt of human art, and the great means of union and communication between the different quarters of the globe.

110 in architecture,

A knowledge of mechanics not much inferior to this is neceſſary for enabling the architect to execute ſome of his greateſt works, ſuch as the erection of domes and arches, which depend on the niceſt adjuſtment of equilibrium. Without this he cannot unite economy with ſtrength; and his works muſt either be clumſy maſſes or flimſy ſhells.

111 in gunnery and other engines, &c.

The effects of artillery cannot be underſtood or ſecured without the ſame knowledge.

The whole employment of the engineer, civil or military, is a continual application of almoſt every branch of mechanical knowledge; and while the promiſes of a Smeaton, a Watt, a Belidor, may be confided in as if already performed, the numberleſs failures and diſappointments in the moſt important and coſtly projects ſhow us daily the ignorance of the pretending crowd of engineers.

The microſcope, the ſteam engine, the thunder-rod, are preſents which the world has received from the natural philoſopher; and although the compaſs and teleſcope were the productions of chance, they would have been of little ſervice had they not been ſtudied and improved by Gilbert, Halley, and Dollond.

But it is not in the arts alone that the influence of natural philoſophy is perceived: it lends its aid to every ſcience, and in every ſtudy.

It is often neceſſary to have recourſe to the philoſopher in diſputes concerning property; and many examples might be given where great injuſtice has been the conſequence of the ignorance of the judges. Knowledge of nature might have prevented many diſgraceful condemnations for ſorcery. 112 in law,

The hiſtorian who is ignorant of natural philoſophy eaſily admits the miraculous into his narrations, accompanies theſe with his reflections, draws conſequences from them, and fills his pages with prodigies, fables, and abſurdity. 113 in hiſtory,

It is almoſt needleſs to ſpeak of the advantages which will accrue to the phyſician from this ſtudy. So cloſe is the connection between it and medicine, that our language has given but one name to the naturaliſt and to the medical philoſopher. Indeed, the whole of his ſtudy is a cloſe obſervation of the laws of material nature, in order to draw from them precepts to direct his practice in the noble art of healing. During the immaturity of general knowledge, while natural philoſophy was the only ſtudy which had acquired any juſt pretenſion to certitude either in its principles or method of inveſtigation, the phyſicians endeavoured to bring the objects of their ſtudy within its province, hoping by this means to get a more diſtinct view of it; and they endeavoured to explain the abſtruſe phenomena of the animal functions by reducing them all to motions, vibrations, colliſions, impulſes, hydroſtatic and hydraulic preſſures and actions, with which the mechanical philoſophers were ſo ardently occupied at that time. But unfortunately their acquaintance with nature was then very limited, and they were but little habituated to the rules of juſt reaſoning; and their attempts to explain the economy of animal life by the laws of mechanics did them but little ſervice either for the knowledge of diſeaſes or of the methods of cure. The mechanical theories of medicine, which had conſiderable reputation about the end of the 17th century, were many of them very ingenious, and had an impoſing appearance of ſymmetry and connection; but are now forgotten, having all been formed on the narrow ſuppoſition that matter was ſubject only to mechanical laws. 114 in medicine,

But the diſcovery of error diminiſhes the chance of again going wrong, eſpecially when the cauſe of error has been diſcovered, and the means pointed out of detecting the miſtakes; and the vital principle muſt combine its influence with, or operate on, the properties of rude matter. It appears therefore evident that a knowledge of the mechanical laws of the material world is not only a convenient, but a neceſſary, accompliſhment

to

Experimental Philosophy.

to the physician. We are fully justified in this opinion, by observing medical authors of the present day introducing into medicine theories borrowed from mechanical philosophy, which they do not understand, and which they continually misapply. Appearance of reasoning frequently conceals the errors in principle, and seldom fails to mislead.

115 in religion, But there is no class of men to whom this science is of more service than to those who hold the honourable office of the teachers of religion. Their knowledge in their own science, and their public utility, are prodigiously hurt by ignorance of the general frame and constitution of nature; and it is much to be lamented that this science is so generally neglected by them, or considered only as an elegant accomplishment: nay, it is too frequently shunned as a dangerous attainment, as likely to unhinge their own faith, and taint the minds of their hearers. We hope, however, that few are either so feebly rooted in the belief of the great doctrines of religion as to fear this, or of minds so base and corrupted as to adopt and inculcate a belief which they have any suspicion of being ill-founded. But many have a sort of horror at all attempts to account for the events of nature by the intervention of general causes, and think this procedure derogatory to the Divine nature, and inconsistent with the doctrine of his particular providence; believing, that "a sparrow does not fall to the ground without the knowledge of our heavenly Father." Their limited conceptions cannot perceive, that, in forming the general law, the Great Artist did at one glance see it in its remotest and most minute consequence, and adjust the vast assemblage so as completely to answer every purpose of His providence. There never was a more eager enquirer into the laws of nature, or more ardent admirer of its glorious Author, that the Hon. Robert Boyle. This gentleman says, that he will always think more highly of the skill and power of that artist who should construct a machine, which, being once set a going, would of itself continue its motion for ages, and from its inherent principles continue to answer all the purposes for which it was first contrived, than of him whose machine required the continual aid of the hand which first constructed it. It is owing to great inattention that this aversion to the operation of secondary causes has any influence on our mind. What do we mean by the introduction of secondary causes? How do we infer the agency of any cause whatever? Would we ever have supposed any cause of the operations of nature, had they gone on without any order or regularity? Or would such a chaos of events, any more than a chaos of existences, have given us any notion of a forming and directing hand? No surely. We see the hand of God in the regular and unvaried course of nature, only because it is regular and unvaried. The philosopher expresses this by saying, that the phenomena proceed by unalterable laws. Greatly mistaken therefore are they who think that we supersede the existence of mind and of providence when we trace things to their causes. A physical law being an unvaried fact, is an indication, and the strongest possible indication, of an unerring mind, who is incapable of change, and must do to day what He always did: for to change is to deviate from what is best *. The operations of unerring mind will therefore be regular and invariable. Physical laws, therefore, or secondary causes, are the best proofs of unerring wisdom. Such regularity of conduct is universally considered as an indication of wisdom among men. The wise man is known by the constancy of his conduct, while no man can depend on the future conduct of a fool.

* *Ferguson's Lectures on Ethics.*

And what astonishing evidences of wisdom do we not observe in the general laws of the material world? They will ever be considered by the intelligent philosopher as the most glorious display of inconceivable wisdom, which has been able, by means so few and so simple, to produce effects which by their grandeur astonish our feeble understandings, and by their inexhaustible variety elude all possibility of enumeration.

While the teachers of religion remain ignorant of the beautiful laws of nature, the great characteristics of the wisdom and goodness of the Almighty Creator, their hearers are deprived of much sublime pleasure; God is robbed of that praise which he would have received from an enlightened people; and the only worship he receives is tainted with mean notions of his attributes, and groundless fears of his power.

But besides these advantages which accrue to different classes of men from this study, there are some effects which are general, and are too important to be passed over unnoticed. 116 and in other sciences.

That spirit of dispassionate experimental enquiry which has so greatly promoted this study, will carry with it, into every subject of enquiry, that precision and that constant appeal to fact and experience which characterize it. And we may venture to assert, that the superior good order and method which distinguish some of the later productions in other sciences, have been in a great measure owing to this mathematical spirit, the success of which in natural philosophy has gained it credit, and thus given it an unperceived influence even over those who have not made it their study. 117 More general advantages of philosophy.

The truths also which the naturalist discovers are such as do not in general affect the passions of men, and have therefore a good chance of meeting with a candid reception. Those whose interest it is to keep men in political or religious ignorance, cannot easily suspect bad consequences from improvements in this science; and if they did, have hardly any pretext for checking its progress. And discoveries accustom the mind to novelty; and it will no longer be startled by any consequences, however contrary to common opinion. Thus the way is paved for a rational and discreet scepticism, and a free enquiry on other subjects. Experiment, not authority, will be considered as the test of truth; and under the guidance of fair experience we need fear no ill as long as the laws of nature remain as they are.

Lastly, since it is the business of philosophy to describe the phenomena of nature, to discover their causes, to trace the connection and subordination of these causes, and thus obtain a view of the whole constitution of nature; it is plain that it affords the surest path for arriving at the knowledge of the great cause of all, of God himself, and for forming proper conceptions of him and of our relations to him: notions infinitely more just than can ever be entertained by the careless spectator of his works. Things which to this man appear solitary and detached, having no other connection

tion with the rest of the universe but the shadowy and fleeting relation of co-existence, will, to the diligent philosopher, declare themselves to be parts of a great and harmonious whole, connected by the general laws of nature, and tending to one grand and beneficent purpose. Such a contemplation is in the highest degree pleasant and cheering, and cannot fail of impressing us with the wish to co-operate in this glorious plan, by acting worthy of the place we hold among the works of God, and with the hopes of one day enjoying all the satisfaction that can arise from conscious worth and consummate knowledge; and this is the worship which God will approve. "This universe (says Boyle) is the magnificent temple of its great Author; and man is ordained, by his powers and qualifications, the high priest of nature, to celebrate divine service in this temple of the universe."

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PHYSIOGNOMONICS, among physicians, denote such signs as, being taken from the countenance, serve to indicate the state, disposition, &c. both of the body and mind: and hence the art of reducing these signs to practice is termed *physiognomy*.

PHYSIOGNOMY

1 Various definitions of physiognomy ancient and modern.

IS a word formed from the Greek φυσις, *nature*, and γινωσκω, *I know*. It is the name of a science which occupied much of the attention of ancient philosophers, and which, since the revival of learning, has in a great degree been disregarded. Till of late it has seldom in modern times been mentioned, except in conjunction with the exploded arts of magic, alchemy, and judicial astrology. Within the last two centuries, no doubt, the bounds of human knowledge have been greatly extended by means of the patient pursuit of fact and experiment, instead of the hasty adoption of conjecture and hypothesis. We have certainly discovered many of the ancient systems to be merely creatures of imagination. Perhaps, however, in some instances, we have decided too rapidly, and rejected real knowledge, which we would have found it tedious and troublesome to acquire. Such has been the fate of the science of physiognomy; which certainly merits to be considered in a light very different from alchemy and those other fanciful studies with which it had accidentally been coupled. The work lately published by M. Lavater on the subject has indeed excited attention, and may perhaps tend to replace physiognomy in that rank in the circle of the sciences to which it seems to be intitled.

It does not appear that the ancients extended the compass of physiognomy beyond *man*, or at least animated nature: But the study of that art was revived in the middle ages, when, misled probably by the comprehensiveness of the etymological meaning of the word, or incited by the prevalent taste for the marvellous, those who treated of the subject stretched the range of their speculation far beyond the ancient limits. The extension of the signification of the term was adopted universally by those naturalists who admitted the theory of signatures (see SIGNATURE); and physiognomy came thus to mean, the knowledge of the *internal* properties of *any* corporeal existence from the *external* appearances. Joannes Baptista Porta, for instance, who was a physiognomist and philosopher of considerable eminence, wrote a treatise on the physiognomy of *plants* (*phitognomonica*), in which he employs physiognomy as the generic term. There is a treatise likewise *De Physiognomia Avium*, written, we believe, by the same person. In the *Magia Physiognomica* of Gaspar Schottus, *physiognomia humana* is made a *subdivision* of the science.

Boyle too adopts the extensive signification mentioned, which indeed seems to have been at one time the usual acceptation of the word (A). At present physiognomy seems to mean no more than "a knowledge of the moral character and extent of intellectual powers of human beings, from their external appearance and manners." In the Berlin Transactions for the years 1769 and 1770 there appears a long controversial discussion on the subject of the *definition* of physiognomy between M. Pernetty and M. Le Cat, two modern authors of some note. Pernetty contends that *all knowledge whatever* is physiognomy; Le Cat confines the subject to the *human face*. Neither seems to have hit the medium of truth. Soon after the celebrated book of Lavater appeared. He indeed defines physiognomy to be "the art of discovering the *interior* of *man* by means of his *exterior*; but in different passages of his work he evidently favours the extended signification of Pernetty. This work gave occasion to M. Formey's attack upon the science itself in the same Berlin Transactions for 1775. Formey strenuously controverts the extent assigned by Lavater to his favourite science.

2 Pythagoras probably brought this science to Greece.

Before the era of Pythagoras the Greeks had little or no science, and of course could not be scientifical physiognomists. Physiognomy, however, was much cultivated in Egypt and India; and from these countries the sage

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(A) They'll find i' the physiognomies
O' th' planets all men's destinies. HUDIBRAS.

ſage of Samos probably introduced the rudiments of this ſcience, as he did thoſe of many others, generally deemed more important, into Greece.

3
It was a profeſſion in the time of Socrates.

In the time of Socrates it appears even to have been adopted as a profeſſion. Of this the well-known anecdote of the deciſion of Zopyrus, on the real character of Socrates himſelf, judging from his countenance, is ſufficient evidence. Plato mentions the ſubject; and by Ariſtotle it is formally treated of in a book allotted to the purpoſe.

It may be worth while to give a brief outline of Ariſtotle's ſentiments on the ſubject.

4
General outline of Ariſtotle's opinions on this ſubject.

Phyſiognomy, he in ſubſtance obſerves, had been treated of in three ways: Some philoſophers claſſed animals into genera, and aſcribed to each genus a certain mental diſpoſition correſponding to their corporeal appearance. Others made a farther diſtinction of dividing the genera into ſpecies. Among men, for inſtance, they diſtinguiſhed the Thracians, the Scythians, the Egyptians, and whatever nations were ſtrikingly different in manners and habits, to whom accordingly they aſſigned the diſtinctive phyſiognomical characteriſtics. A third ſet of phyſiognomiſts judged of the actions and manners of *the individual*, and preſumed that certain manners proceeded from certain diſpoſitions. But the method of treating the ſubject adopted by Ariſtotle himſelf was this: A peculiar form of body is invariably accompanied by a peculiar diſpoſition of mind; a human intellect is never found in the corporeal form of a beaſt. The mind and body reciprocally affect each other; thus in intoxication and mania the mind exhibits the affections of the body; and in fear, joy, &c. the body diſplays the affections of the mind.

From ſuch facts he argues, that when in man a particular bodily character appears, which by prior experience and obſervation has been found uniformly accompanied by a certain mental diſpoſition, with which therefore it muſt have been neceſſarily connected; we are intitled in all ſuch caſes to infer the diſpoſition from the appearance. Our obſervations, he conceives, may be drawn from other animals as well as from men: for as a lion poſſeſſes one bodily form and mental character, a hare another, the corporeal characteriſtics of the lion, ſuch as ſtrong hair, deep voice, large extremities, diſcernible in a human creature, denote the ſtrength and courage of that noble animal; while the ſlender extremities, ſoft down, and other features of the hare, viſible in a man, betray the mental character of that puſillanimous creature.

Upon this principle Ariſtotle treats of the corporeal features of man, and the correſpondent diſpoſitions, ſo far as obſerved: he illuſtrates them by the analogy juſt mentioned, and in ſome inſtances attempts to account for them by phyſiological reaſoning.

At the early period in which Ariſtotle wrote, his theory, plauſible certainly, and even probable, diſplays his uſual penetration and a conſiderable degree of knowledge. He diſtinctly notices individual phyſiognomy, national phyſiognomy, and comparative phyſiognomy. The ſtate of knowledge in his time did not admit of a complete elucidation of his general principles; on that account his enumeration of particular obſervations and precepts is by no means ſo well founded or ſo accurate as his method of ſtudy. Even his ſtyle, conciſe and energetic, was inimical to the ſubject; which, to be made clearly comprehenſible, muſt require frequent paraphraſes. Ariſtotle's performance, however, ſuch as it is, has been taken as the groundwork and model of every phyſiognomical treatiſe that has ſince appeared.

The imitators of this great man in the 16th and 17th centuries have even copied his language and manner, which are ſententious, indiſcriminate, and obſcure. His comparative phyſiognomy of men with beaſts has been frequently though not univerſally adopted. Beſides his treatiſe expreſsly on the ſubject, many incidental obſervations on phyſiognomy will be found interſperſed through his other works, particularly in his hiſtory of animals.

5
Theophraſtus's ethic characters form an important branch of phyſiognomy.

Next after Ariſtotle, his diſciple and ſucceſſor Theophraſtus would deſerve to be particularly mentioned as a writer on the ſubject in queſtion. His ethic characters, a ſingular and entertaining performance, compoſed at the age of 99, form a diſtinct treatiſe on a moſt important branch of phyſiognomy, *the phyſiognomy of manners*; but the tranſlations and imitations of La Bruyere are ſo excellent, that by referring to them we do greater juſtice than would otherwiſe be in our power, both to Theophraſtus and to our readers. We cannot, however, omit obſerving, that the accuracy of obſervation and livelineſs of deſcription diſplayed in the work of Theophraſtus will preſerve it high in claſſical rank, while the ſcience of man and the prominent characteriſtics of human ſociety continue to be objects of attention.

6
Other Greek authors on this ſubject.

Polemon of Athens, Adamantius the ſophiſt, and ſeveral others, wrote on the ſubject about the ſame period. Lately there was publiſhed a collection of all the Greek authors on phyſiognomy: the book is entitled, *Phyſiognomiæ veteris ſcriptores Græci, Gr. et Lat. à Franzio Altenb.* 1780, 8vo.

7
The ſcience was then coupled with ſomething of the marvellous.

From the number of theſe authors, it appears that the ſcience was much cultivated in Greece; but the profeſſors ſeem ſoon to have connected with it ſomething of the marvellous. This we have cauſe to ſuſpect from the ſtory told by Apion of Apelles: *Imaginem adeo ſimilitudinis indiſcretæ pinxit, ut (incredibile dictu) Apion Grammaticus Scriptum reliquerit quemdam ex facie hominum ad divinantem (quos metopoſcopos vocant) ex iis dixiſſe aut futuræ mortis annos, aut præteritæ* *. The noviciates of the Pythagorean ſchool were ſubjected to the phyſiognomic obſervation of their teachers, and it is probable the firſt phyſiognomiſts by profeſſion among the Greeks were of this ſect. They, too, to whom, from the nature of their doctrines and diſcipline, myſtery was familiar, were the firſt, it is likely, who expoſed the ſcience of phyſiognomy in Greece to diſgrace, by blending with it the art of divination.

* *Pliny Nat. Hiſt.* lib. 35. § 35. par. 39.

8
The obſervations of Roman and other writers.

From the period of which we have been treating to the cloſe of the Roman republic, nothing worthy of remark occurs in the literary hiſtory of phyſiognomy. About the laſt-mentioned era, however, and from thence to the decline of the empire under the later emperors, the ſcience appears to have been cultivated as an important branch of erudition, and aſſumed as a profeſſion by perſons who had acquired a ſuperior knowledge in it.

In the works of Hippocrates and Galen, many phyſiognomical obſervations occur. Cicero appears to have been peculiarly attached to the ſcience. In his oration

tion againſt Piſo, and in that in favour of Roſcius, the reader will at the ſame time perceive in what manner the orator employs phyſiognomy to his purpoſes, and find a curious inſtance of the *ancient* manner of oratorical *abuſe*.

Many phyſiognomical remarks are to be found likewiſe in the writings of Salluſt, Suetonius, Seneca, Pliny, Aulus Gellius, Petronius, Plutarch, and others.

That in the Roman empire the ſcience was practiſed as a profeſſion, ample evidence appears in the writings of ſeveral of the authors juſt mentioned. Suetonius, for inſtance, in his *Life of Titus*, mentions that Narciſſus employed a *phyſiognomiſt* to examine the features of Britannicus, who predicted that Britannicus would not ſucceed, but that the empire would devolve on Titus.

9
This ſcience fell with the Roman empire.

The ſcience of phyſiognomy ſhared the ſame fate with all others, when the Roman empire was overthrown by the northern barbarians. About the beginning of the 16th century it began again to be noticed.—From that time till the cloſe of the 17th, it was one of the moſt faſhionable ſtudies. Within that ſpace have appeared almoſt all the approved modern authors on the ſubject (B).

It has been unfortunate for phyſiognomy, that by many of theſe writers it was held to be connected with doctrines of which the philoſophy of the preſent day would be aſhamed. With theſe doctrines it had almoſt ſunk into oblivion.

10
Particular ſtudies have peculiarly prevailed at particular times.

In every period of the hiſtory of literature there may eaſily be marked a prevalence of particular ſtudies. In the early period, for inſtance, of Grecian literature, *mythological morality* claimed the chief attention of the philoſophers. In the more advanced ſtate of learning in Greece and in Rome, *poetry*, *hiſtory*, and *oratory*, held the pre-eminence. Under the latter emperors, and for ſome time afterwards, the hiſtory of *theological controverſies* occupied the greateſt part of works of the learned. Next ſucceeded *metaphyſics*, and *metaphyſical theology*. Theſe gave place to *alchemy*, *magic*, *judicial aſtrology*, the doctrine of ſignatures and ſympathies, the *myſtic*, *theoſophic*, *and Roſicrucian theology*, with phyſiognomy. Such were the purſuits contemporary with the ſcience which is the object of our preſent inquiry. It is no matter of ſurpriſe, that, ſo aſſociated, it ſhould have fallen into contempt. It is not unuſual for mankind haſtily to reject valuable opinions, when accidentally or artificially connected with others which are abſurd and untenable. Of the truth of this remark, the hiſtory of theology, and the preſent tone of theological opinions in Europe, furniſh a pregnant example.

To phyſiognomy, and the exploded ſciences laſt mentioned, ſucceeded *claſſic philology*; which gave place to *modern poetry* and *natural philoſophy*; to which recently have been added the ſtudies of *rational theology*, *chemiſtry*, the *philoſophy of hiſtory*, the *hiſtory of man*, and the *ſcience of politics*.

11
The obſervations of the writers of the preſent century on this ſubject.

About the commencement of the 18th century, and thence forward, the occult ſciences, as they are termed, had declined very conſiderably in the eſtimation of the learned; and thoſe who treated of phyſiognomy forbore to diſgrace it by a connection with thoſe branches of ideal learning with which formerly it had been invariably conjoined. In Britain, Dr Gwither noticed it with approbation.—His remarks are publiſhed in the Philoſophical Tranſactions, vol. xviii.; and Dr Parſons choſe it for the ſubject of the Croonean lectures, publiſhed at firſt in the ſecond ſupplement to the 44th volume of the Philoſophical Tranſactions, and afterwards (1747) in a ſeparate treatiſe, entitled *Human Phyſiognomy explained*.

The obſervations, however, of theſe writers, as well as of Lancifius, Haller, and Buffon, relate rather to the tranſient expreſſion of the paſſions than to the permanent features of the face and body. The well-known characters of Le Brun likewiſe are illuſtrative of the tranſient phyſiognomy, or (as it is termed) pathognomy.—See PASSIONS in *Painting*.

12
We find nothing very important till the controverſy between Pernetty and Le Cat.

During the preſent century, although phyſiognomy has been now and then attended to, nothing of importance appeared on the ſubject till the diſcuſſion already mentioned between Pernetty and Le Cat, in the Berlin Tranſactions. The ſentiments of theſe authors, in ſo far as relates to the *definition* of phyſiognomy, have been above noticed. Their eſſays are, beſides, employed in diſcuſſing the following queſtions: 1ſt, Whether it would or would not be advantageous to ſociety, were the character, diſpoſition, and abilities, of each individual ſo marked in his appearance as to be diſcovered with certainty?

2dly, Whether, on the ſuppoſition that by the higheſt poſſible proficiency in phyſiognomy, we could attain a knowledge in part only of the internal character, it would be advantageous to ſociety to cultivate the ſtudy, mankind being in general imperfect phyſiognomiſts?

No reaſoning *à priori* can poſſibly determine theſe queſtions. Time and experience alone muſt aſcertain the degree of influence which any particular acquiſition of knowledge would have on the manners and characters of mankind; but it is difficult to conceive how the *reſult* of any portion of knowledge, formerly unknown, and which mankind would be *permitted* to diſcover, could be any thing but beneficial.

13
Lavater's celebrated Work.

Soon after this controverſy in the Berlin Tranſactions, appeared the great work of M. Lavater, dean of Zurich, which has excited no inconſiderable portion of attention in the literary world. The work itſelf is magnificent: That circumſtance, as well as the nature of the ſubject, which was ſuppoſed to be fanciful, have contributed to extend

(B) They are, Bartholem. Cocles, Baptiſta Porta, Honoratus Nuquetius, Jacobus de Indagine, Alſtedius, Michael Schottus, Gaſpar Schottus, Cardan, Taiſnierus, Fludd, Behmen, Barclay, Claromontius, Conringius, the commentaries of Auguſtin Niphus, and Camillus Balbus, on the Phyſiognomica of Ariſtotle,—Spontanus, Andreas Henricus, Joannes Digander, Rud. Goclenius, Alex. Achillinus, Joh. Pretorius, Jo. Belot, Guliel. Gratalorus, &c. They are noticed in the Polyhiſtor of Morhoff, vol. i. lib. i. cap. 15. § 4. and vol. ii. lib. iii. cap. 1. § 4.

extend its fame; and certainly, if we may judge, the book, though many faults may be detected in it, is the moſt important of any that has appeared on the ſubject ſince the days of Ariſtotle. Lavater profeſſes not to give a complete ſynthetical treatiſe on phyſiognomy, but, aware that the ſcience is yet in its infancy, he exhibits fragments only, illuſtrative of its different parts. His performance is no doubt deſultory and unconnected. It contains, however, many particulars much ſuperior to any thing that had ever before appeared on the ſubject.

With the ſcholaſtic and ſyſtematic method adopted by the phyſiognomiſts of the laſt and preceding centuries, Lavater has rejected their manner of writing, which was dry, conciſe, indeterminate, and general: His remarks, on the contrary, are, for the moſt part, preciſe and particular, frequently founded on diſtinctions extremely acute. He has omitted entirely (as was to be expected from a writer of the preſent day) the aſtrological reveries, and ſuch like, which deform the writings of former phyſiognomiſts; and he has with much propriety deduced his phyſiognomical obſervations but ſeldom from anatomical or phyſiological reaſoning. Such reaſoning may perhaps at ſome future period become important; but at preſent our knowledge of facts, although extenſive, is not ſo univerſal, as to become the ſtable foundation of particular deductions. Lavater has illuſtrated his remarks by engravings; a method firſt adopted by Baptiſta Porta.—Lavater's engravings are very numerous, often expreſſive, and tolerably executed.

14 His opinions the reſult of obſervation.

The opinions of this celebrated phyſiognomiſt are evidently the reſult of actual obſervation. He appears indeed to have made the ſcience his peculiar ſtudy, and the grand purſuit of his life. His performance exhibits an extended comprehenſion of the ſubject, by a particular attention to *oſſeal* phyſiognomy, and the effect of *profiles* and *contours*. His ſtyle in general is forcible and lively, although ſomewhat declamatory and digreſſive. His expreſſions are frequently preciſe, and ſtrikingly characteriſtic; and the ſpirit of piety and benevolence which pervades the whole performance renders it highly intereſting.

15 His imagination has, however, often outſtript his judgement.

The defects of the work, however, detract much from the weight which Lavater's opinions might otherwiſe challenge. His imagination has frequently ſo far outſtript his judgment, that an ordinary reader would often be apt to reject the whole ſyſtem as the extravagant reverie of an ingenious theoriſt. He has clothed his favourite ſcience in that affected myſterious air of importance, which was ſo uſual with his predeceſſors, and deſcribes the whole material world to be objects of the univerſal dominion of phyſiognomy *. He whimſically conceives it neceſſary for a phyſiognomiſt to be a well-ſhaped handſome man †. He employs a language which is often much too peremptory and deciſive, diſproportioned to the real ſubſtance of his remarks, or to the occaſion of making them. The remarks themſelves are frequently oppoſite in appearance to common obſervation, and yet unſupported by any illuſtrations of his.

* Vol. i. p. 33.—38. vol. ii. p. 89. French tranſlation.
† Vol. i. p. 126.

16 Other weakneſſes of this great phyſiognomiſt.

Lavater certainly errs in placing too great a reliance on ſingle features, as the foundation of deciſion on character. His opinions on the phyſiognomy of the ears, hands, nails, and feet of the human ſpecies, on hand-writing, on the phyſiognomy of birds, inſects, reptiles, and fiſhes, are obviouſly premature, as hitherto no ſufficient number of accurate obſervations has been made, in regard to either of theſe particulars, to authoriſe any concluſion. He has erred in the oppoſite extreme, when treating of the important topic of national phyſiognomy, where he has by no means proſecuted the ſubject ſo far as facts might have warranted. We muſt farther take the liberty to object to the frequent introduction of the author's own phyſiognomy throughout the courſe of his work. His ſingular remarks on his own face do not ſerve to prejudice the reader in favour of his judgment, however much his character may juſtify the truth of them. We muſt regret likewiſe, for the credit of the ſcience, that the author's ſingularly fanciful theory of apparitions ſhould ſo nearly reſemble a revival of the antiquated opinions of the ſympathiſts.

To theſe blemiſhes, which we have reluctantly enumerated, perhaps may be added that high impaſſioned tone of enthuſiaſm in favour of his ſcience everywhere diſplayed throughout the work of this author, which is certainly very oppoſite to the cool patient inveſtigation befitting philoſophy. To that enthuſiaſm, however, it is probable that in this inſtance (as is, indeed, no unfrequent effect of enthuſiaſm) we are indebted for the excellency which the author has attained in his purſuit; and it poſſeſſes the ſalutary tendency of putting us on our guard againſt a too implicit acquieſcence in his phyſiognomical deciſions.

17 His work was attacked in the Berlin Tranſactions by M. Formey.

In the Berlin Tranſactions for 1775, there appears a formal attack upon Lavater's work by M. Formey. This eſſay we have already mentioned. After diſputing the propriety of the extenſive ſignification applied by Lavater and Pernetty to the term phyſiognomy, M. Formey adopts nearly the ſame definition which we conceive to be the moſt proper, and which we have pu down as ſuch near the beginning of this article. He allows that the mental character is intimately connected with, and ſenſibly influenced by, every fibre of the body; but his principal argument againſt phyſiognomy is, that the human frame is liable to innumerable accidents, by which it may be changed in its external appearance, without any correſpondent change of the diſpoſition; ſo that it ſurpaſſes the extent of the ſkill of mortals to diſtinguiſh the modifications of feature that are natural, from thoſe which may be accidental. Although, therefore, the ſcience of phyſiognomy may be founded in truth, he infers that the Deity only can exerciſe it.

M. Formey further contends, that education, diet, climate, and ſudden emotions, nay even the temperaments of anceſtors, affect the caſt of human features; ſo that the influence of mental character on theſe features may be ſo involved with, or hidden by, accidental circumſtances, that the ſtudy of phyſiognomy muſt ever be attended by hopeleſs uncertainty. Theſe objections are worthy of notice, but they are by no means concluſive.

18 Lavater's mode of treating his ſubject.

We ſhall give a ſpecimen of M. Lavater's manner of treating the ſubject on the oppoſite ſide of the queſtion: A ſpecimen, not in Lavater's preciſe words, but conveying more ſhortly an idea at once of his ſentiments, and of his manner of expreſſing them.

19 Phyſiognomy is juſtly called a ſcience.

No ſtudy, ſays he, excepting mathematics, more juſtly deſerves to be termed *a ſcience* than phyſiognomy. It is a department of phyſics, including theology and belles lettres, and in the ſame manner with theſe ſciences

may

may be reduced to rule. It may acquire a fixed and appropriate character: It may be communicated and taught.

Truth or knowledge, explained by fixed principles, becomes ſcience. Words, lines, rules, definitions, are the medium of communication. The queſtion, then, with reſpect to phyſiognomy, will thus be fairly ſtated. Can the ſtriking and marked differences which are viſible between one human face, one human form, and another, be explained, not by obſcure and confuſed conceptions, but by certain characters, ſigns, and expreſſions? Are theſe ſigns capable of communicating the vigour or imbecility, the ſickneſs or health, of the body; the wiſdom, the folly, the magnanimity, the meanneſs, the virtue, or the vice, of the mind?

20 Experiment is limited in extent.

It is only to a certain extent that even the experimental philoſopher can purſue his reſearches. The active and vigorous mind, employed in ſuch ſtudies, will often form conceptions which he ſhall be incapable of expreſſing in words, ſo as to communicate his ideas to the feebler mind, which was itſelf unable to make the diſcovery: But the lofty, the exalted mind, which ſoars beyond all written rule, which poſſeſſes feelings and energies reducible to no law, muſt be pronounced unſcientific.

21 Phyſiognomical truth may be defined and communicated to a certain length.

It will be admitted, then, that to a certain degree phyſiognomical truth may as a ſcience be defined and communicated. Of the truth of the ſcience there cannot exiſt a doubt. Every countenance, every form, every created exiſtence, is individually diſtinct, as well as different, in reſpect of claſs, race, and kind. No one being in nature is preciſely ſimilar to another. This propoſition, in ſo far as regards man, is the foundation-ſtone of phyſiognomy. There may exiſt an intimate analogy, a ſtriking ſimilarity, between two men, who yet being brought together, and accurately compared, will appear to be remarkably different. No two minds perfectly reſemble each other. Now, is it poſſible to doubt that there muſt be a certain native analogy between the external varieties of countenance and form and the internal varieties of the mind? By anger the muſcles are rendered protuberant: Are not, then, the angry mind, and the protuberant muſcles, as cauſe and effect? The man of acute wit has frequently a quick and lively eye. Is it poſſible to reſiſt the concluſion, that between ſuch a mind and ſuch a countenance there is a determinate relation?

Every thing in nature is eſtimated by its phyſiognomy; that is, its external appearance. The trader judges by the colour, the fineneſs, the exterior, the *phyſiognomy* of every article of traffic; and he at once decides that the buyer "has an honeſt look," or "a pleaſing or forbidding countenance."

22 This knowledge, however improved, would not be detrimental to man.

That knowledge and ſcience are detrimental to man, that a ſtate of rudeneſs and ignorance are preferable and productive of more happineſs, are tenets now deſervedly exploded. They do not merit ſerious oppoſition. The extenſion and increaſe of knowledge, then, is an object of importance to man: And what object can be ſo important as the knowledge of man himſelf? If knowledge can influence his happineſs, the knowledge of himſelf muſt influence it the moſt. This uſeful knowledge is the peculiar province of the ſcience of phyſiognomy. To conceive a juſt idea of the advantages of phyſiognomy, let us for a moment ſuppoſe that all phyſiognomical knowledge were totally forgotten among men; what confuſion, what uncertainty, what numberleſs miſtakes, would be the conſequence? Men deſtined to live in ſociety muſt hold mutual intercourſe. The knowledge of man imparts to this intercourſe its ſpirit, its pleaſures, its advantages.

Phyſiognomy is a ſource of pure and exalted mental gratification. It affords a new view of the perfection of Deity; it diſplays a new ſcene of harmony and beauty in his works; it reveals internal motives, which without it would only have been diſcovered in the world to come. The phyſiognomiſt diſtinguiſhes accurately the permanent from the habitual, the habitual from the accidental, in character. Difficulties, no doubt, attend the ſtudy of this ſcience. The moſt minute ſhades, ſcarcely diſcernible to the unexperienced eye, denote often total oppoſition of character. A ſmall inflexion, diminution, lengthening or ſharpening, even though but of a hair's-breadth, may alter in an aſtoniſhing degree the expreſſion of countenance and character. How difficult then, how impoſſible indeed, muſt this variety of the ſame countenance render preciſion? The ſeat of character is often ſo hidden, ſo maſked, that it can only be detected in certain, perhaps uncommon, poſitions of countenance. Theſe poſitions may be ſo quickly changed, the ſigns may ſo inſtantaneouſly diſappear, and their impreſſion on the mind of the obſerver may be ſo ſlight, or theſe diſtinguiſhing traits themſelves ſo difficult to ſeize, that it ſhall be impoſſible to paint them or deſcribe them in language. Innumerable great and ſmall accidents, whether phyſical or moral, various incidents and paſſions, the diverſity of dreſs, of poſition, of light or ſhade, tend to diſplay the countenance often in ſo diſadvantageous a point of view, that the phyſiognomiſt is betrayed into an erroneous judgment of the true qualities of the countenance and character. Such cauſes often occaſion him to overlook the eſſential traits of character, and to form a deciſion on what is purely accidental.—How ſurpriſingly, for inſtance, may the ſmallpox disfigure the countenance, and deſtroy or confound, or render imperceptible, traits otherwiſe the moſt deciſive?

23 It affords great mental gratification.

24 Difficulties in the ſtudy.

We ſhall, then, continues Lavater, grant to the oppoſer of phyſiognomy all he can aſk; and yet we do not live without hopes that many of the difficulties ſhall be reſolved which at firſt appeared inexplicable. 25 May one day be obviated.

He then proceeds to a ſpecific illuſtration of his ſubject under a great variety of titles, in which he treats of human nature in general, and of each particular feature ſeparately. 26 The nature of Lavater's work.

To enumerate the different diviſions of his book would not be more ſatisfactory to our readers than the peruſal of the *contents* of the book itſelf; and an attempt to epitomize even the eſſential ſubſtance of the vaſt multiplicity of matter contained in his eſſays, (which are yet only *fragments*, and to which indeed he himſelf does not pretend to give any higher appellation), would extend this article to a diſproportionate length. Such an abridgement, after all, would convey no ſolid information on a ſubject which merits all the time and ſtudy that an attentive peruſal of Lavater's works at large would require.

27 Probable cauſes of the diſrepute into which this ſcience has fallen.

From the hiſtorical deduction of the literary progreſs of phyſiognomy which we have thus attempted to lay before our readers, it appears, that although the ſcience has fallen into diſrepute, there can ſcarcely be mention-

ed a period in which any cultivation of science took place when physiognomy was not likewise the study, nay sometimes even the profession, of men of the most eminent abilities and the greatest learning.

The reasons why at present so little attention is paid to the subject probably are,

1st, That it has been treated in conjunction with subjects now with propriety exploded: And,

2dly, That it has been injured by the injudicious assertions and arguments of those who have undertaken its defence.

Sometimes, however, the wise and the learned may err. The use of any thing must not be rejected for no better reason than that it is capable of abuse. Perhaps the era is not distant when physiognomy shall be reinstated in the rank which she merits among the valuable branches of human knowledge, and be studied with that degree of attention and perseverance which a subject deserves so essentially connected with the science of man.

28 There is a relation between the dispositions of the mind and the features of the face.

That there is an intimate relation between the dispositions of the mind and the features of the countenance is a fact which cannot be questioned. He who is sinking under a load of grief for the death of an affectionate wife or a dutiful child, has a very different cast of features from the man who is happy in the prospect of meeting his mistress. A person boiling with anger has a threatening air in his countenance, which the most heedless observer never mistakes; and if any particular disposition be indulged till it become habitual, there cannot be a doubt but that the corresponding traces will be so fixed in the face as to be discernible by the skilful physiognomist, under every effort made to disguise them. But when we attempt to decide on a man's intellectual powers by the rules of this science, we are often deceived; and in this respect we have reason to believe that Lavater himself has fallen into the grossest mistakes.

29 Craniognomic system of Dr Gall.

Connected with physiognomy, we may consider the *craniognomic* system of Dr Gall of Vienna, which is so called, because, from the exterior form of the cranium, he infers the powers and dispositions of the mind. The brain, he observes, is the material organ of the action of the mind; and as it increases in direct proportion to the faculties of animals, he has endeavoured to prove, that the faculties are distinct and independent on each other; that each has its proper material organ, and that the expansion of the organ is in proportion to the strength of the faculty. This system is attempted to be established by the following reasoning.

"The internal faculties, (says Dr Bojanus, the author of a view of this system), do not always exist in the same proportion to each other. There are some men who have a great deal of genius without having a memory, who have courage without circumspection, and who possess a metaphysical spirit without being good observers.

"Besides, the phenomena of dreaming, of somnambulism, of delirium, &c. prove to us that the internal faculties do not always act together; that there is often a very great activity of one, while the rest are not sensible.

"Thus, in old age, and sometimes in disease, such, for example as madness, several faculties are lost, while others subsist; besides a continued employment of the same faculty sensibly diminishes its energy: If we employ another, we find it has all the force of which it is susceptible; and if we return to the former faculty, it is observed that it has resumed its usual vigour. It is thus that, when fatigued with reading an abstract philosophical work, we proceed with pleasure to a poetical one, and then resume with the same attention our former occupation."

"All these phenomena prove that the faculties are distinct and independent of each other, and we are inclined to believe that the case is the same with their material organs."

"[We do not entirely agree with this idea of Dr Gall, and we believe, on the contrary, that the separation of the material organs ought to be considered as the cause of the distinction of the internal faculties. It appears, to us at least, that by supposing the faculties themselves as originally separated, we cannot save ourselves from falling into materialism, which exists when the mind is no longer considered as unity.]

"*The expansion of the organs contained in the cranium is in the direct ratio of the force of their corresponding faculties.*"

"This principle, dictated by analogy, rests on this axiom, that throughout all nature the faculties are always found to be proportioned to their relative organs; and the truth of it is proved in a special manner by the particular observations of Dr Gall.

"It is however to be remarked, that exercise has a great influence on the force of the faculties, and that an organ moderately expanded, but often exercised, can give a faculty superior to that which accompanies a very extensive organ never put in action; as we see that a man of a weak conformation acquires, by continued exercise, strength superior to another of a more athletic structure.

"[We must here mention an opinion which seems to result immediately from this principle, and which, however, is false: It is, that the volume of the brain, in general, is in the direct ratio of the energy of its faculties. Observation has proved to Dr Gall, that we cannot judge of the strength of the faculties but by the developement of the separate organs which form distinct eminences in the cranium; and that a cranium perfectly round, of whatever size it may be, is never a proof of many or of great faculties.]

"We do not recollect to have heard the reason assigned by Dr Gall; but, in our opinion, these brains may be considered as in a state analogous to obesity; and as we do not judge of the muscular force of a man or an animal by the volume of their members, but by the developement of the muscles in particular, one would think we ought, in like manner, to judge of the strength of the faculties by the developement of the relative organs.

"In the last place, the 4th principle, the most important for practice in regard to the system of Dr Gall, is:

"*We may judge of these different organs and of their faculties by the exterior form of the cranium.*

"The truth of this principle is founded upon another, viz. that the conformation of the cranium depends on that of the brain; a truth generally acknowledged, and proved by the anterior part of the brain, by the impressions in the anterior part of the cranium, and by other facts.

[There are skulls, it is true, in which an external protuberance

protuberance of the bone correfponds to an interior one; and this irregularity, which is found fometimes as a difeafe, and moft commonly at an advanced age, when the cerebral organs do not oppofe the fame refiftance to the cranium, renders the practice of Dr Gall's fyftem, in fome meafure, uncertain.]

"Guided by thefe principles, Dr Gall examines the nature of the fkull, compares the crania of animals and thofe of men analogous and different in faculties. His refearches have proved to him, in a manner almoft incontestable, not only the above truths, but that the faculties of animals are analogous to thofe of man; that what we call inftinct in animals is found alfo in the latter, fuch as attachment, cunning, circumfpection, courage, &c.; that the quantity of the organs fixes the difference of the genus of animals, their reciprocal proportion that of individuals; that the difpofition originally given to each faculty by nature may be called forth by exercife and favourable circumftances, and fometimes by difeafe, but that it never can be created in the cafe where it has not been given by nature (c); that the accumulation of the organs takes place in a conftant manner from the hind part forwards, from the bottom to the top, in fuch a manner, that animals in proportion as they approach man in the quantity of their faculties have the fuperior and anterior part of the brain more expanded; and, in the laft place, that in the moft perfect animal, man, there are organs in the anterior and fuperior parts of the frontal bone, and of the parietals, deftined for faculties which belong to them exclufively. It is under the latter point of view that the difcoveries of Dr Gall agree perfectly with the theory of the facial angle, which feems ftill further to eftablifh the truth of them."

Moft of our readers will probably be fatisfied with the fhort view which we have now given of this fanciful and vifionary fyftem; but fuch as wifh for a fuller expofition of it, may confult the Philofophical Magazine, vol. xiv. p. 77. from which the above is extracted. We fhall only add the names of a few of the organs, which the author of the fyftem thinks he has difcovered. *Organ of the tenacity of life. Organ of mufic. Organ of fighting. Organ of murder. Organ of cunning. Organ of arithmetic. Organ of thieving*, &c.

PHYSIOLOGY.

INTRODUCTION.

1 Definition and objects of phyfiology.

1. PHYSIOLOGY is that part of phyfical fcience which treats of the nature, properties, and functions of living bodies; comprehending under this term, animals and vegetables. The word is derived from φυσις, "nature," and λογος, "a difcourfe; and fignified originally what we may call *natural knowledge*.

The object of this fcience is to examine and compare the phenomena of life; to difcover the properties, powers, and operations of the bodies that are actuated by this principle, and to purfue the developement, progrefs, and decay of vital energy, from brute matter, which poffeffes no portion of vitality, to the moft perfect animal, which feems to have it in the greateft perfection.

2 Divifions.

2. Phyfiology may be confidered under three heads; *hiftorical, philofophical* or *rational*, and *practical* phyfiology.

3 Hiftorical phyfiology.

3. *Hiftorical phyfiology* is occupied in giving a fimple relation of the facts and phenomena that take place in living bodies; in bringing them together, and comparing thofe which fucceed each other without interruption during the exiftence of vitality.

4 Philofophical phyfiology.

4. It is the bufinefs of *philofophical phyfiology* to confider the nature of thefe phenomena, and endeavour to deduce from them fome general conclufions, by which they may be explained or elucidated; to draw from them natural confequences, and unfold fucceffively their analogies and relations; to arrange, diftribute, and claffify them, and thus acquire fufficient *data* by which to difcover the caufes which produce them.

5 Practical phyfiology.

The *practical* part of phyfiology is intended to point out the application of the principles of the fcience to the ufeful purpofes of life, efpecially to medicine and agriculture. Of thefe divifions the firft is the moft important, as, until we have acquired a pretty complete knowledge of the facts relating to living beings, and arranged thefe in a natural manner, it cannot be expected that we fhould make any great progrefs in explaining them, or inveftigating their caufes. From the multitude, variety, and complex nature of thefe phenomena, a complete view of them is extremely difficult, and requires the united efforts of genius, dexterity, patience, and difcernment.

6 Relations to anatomy.

Phyfiology is intimately related to feveral other departments of natural knowledge. Its relation to anatomy is the moft ftrict and natural; and indeed the knowledge of the ftructure of living bodies is a neceffary introduction to that of their properties and functions. So clofe is the union between thefe two fciences, that it is generally thought that the ftudy of them fhould go hand in hand. Certain it is, that, without phyfiology, anatomy is a dry and uninterefting ftudy; while, on the other hand, phyfiology, unaided by anatomy, is obfcure and uncertain. It is by means of anatomy that we learn the ftructure and organization of the animal machine; the difpofition and form of its feveral members; the parts that concur in the compofition of them; the arrangement and the connection of thefe: it is by means of anatomy that we know how to eftimate the advantages

(c) The germ of every organ muft exift in embryo, if the expanfion of that organ is to be afterwards called forth.

Introduction. ges of any particular conformation; that we eſtimate the proportion between the ſolid and fluid parts of the body, and the adaptation of the organs to the various uſes for which they are deſtined. But we muſt remember, that the aid of anatomy in phyſiological reſearches, extends no farther than to the mechanical arrangement and relation of the ſeveral parts of the body; it teaches us nothing of its intimate compoſition, and much leſs does it inform us reſpecting the vital powers and mental energies diſplayed by the living body. The moſt accurate inſpection of the brain will afford us no light reſpecting the obſcure function of ſenſation, and the hidden operation of thought and judgment; nor will the niceſt diſſection of the eye, or of the tongue, ſhew us how the former is enabled to convey to us the ideas of external objects, or how the latter imparts to us the thouſand varied flavours of ſapid bodies. In ſhort, we may conclude, that the more the exerciſe of any function depends on the ſtructure and organization of the organs that perform it, the more capable is it of illuſtration from anatomy.

7 chemiſtry, The ſcience of chemiſtry has proved of eminent uſe in explaining ſeveral functions of the animal economy, which, without its aſſiſtance, would have been very imperfectly underſtood. The action of the air on the blood during reſpiration, and the digeſtion of food in the ſtomach, are found to depend chiefly on chemical operations; while this ſcience has explained to us, in a moſt ſatisfactory manner, the nature, compoſition, and reciprocal action of the component principles of organized beings, and the nature of ſeveral changes which they undergo, both in the living and the dead ſtate. But if we extend the application of chemiſtry too far, and imagine, as ſome of our modern chemical phyſiologiſts have done, that it is capable of explaining *life*, *motion*, and even *ſenſation*, we ſhall only betray our own preſumption and our ignorance of vital phenomena. When the performance of any function depends on the intimate compoſition of its organs, or the combinations and decompoſitions that take place among their component principles; then, and then only, is it ſuſceptible of chemical illuſtration.

8 mechanical philoſophy, Mechanical philoſophy is employed with advantage in explaining ſome of the phenomena that take place in living beings. The ſtrength and ſolidity of the bony compages; the force and direction of the muſcular motions; the propagation, direction, and mechanical effect of light, ſound, odours; the effects of the gravity and elaſticity of atmoſpheric air, and a few other circumſtances, may be ſubmitted to calculation, and illuſtrated on phyſical principles: but the laws of mechanical and of vital action are, in general, ſo different, and even the moſt mechanical phenomena of living beings are often ſo modified and counteracted by the agency of the vital powers, that, on the whole, we muſt conſider general phyſics as one of the leaſt uſeful auxiliaries of phyſiological reſearches.

9 metaphyſics, Of all the branches of phyſical ſcience, phyſiology certainly makes the neareſt approach to the region of metaphyſics; but yet there is a difference between theſe, though it may not be very eaſy to point out the preciſe line of termination. Phyſiology, as already defined, being that ſcience which has for its object the organical economy of living bodies, the word organical, we think, here ſhould mark the diſtinction.

Introduction. Whenever the economy of living bodies indicates deſign, and cannot reſult from any combination or ſtructure of organs, it muſt be ſuppoſed the effect of ſomething different from matter, and whoſe explanation belongs to that ſcience which is called *metaphyſics*, or which we might term the *philoſophy of the mind*. By aſcribing, indeed, to the glandular contents within the cranium, and to that fiction animal ſpirits, the motives of action, the ſuperficial and ill-informed may have been led to an opinion that perception, memory, and imagination, are the functions of the *cerebrum*, the *medulla oblongata*, and *cerebellum*; that the ſoul is a conſequence of organization; and the ſcience which treats of it only a particular branch of phyſiology. But mind and its faculties are now ſo well underſtood and inveſtigated, that this opinion can ſeldom prevail but where penetration is not remarkable for its acuteneſs, or where reflection, reading, and reſearch, have long been confined within the limits of a narrow circle.

Some metaphyſical phyſiologiſts contend, that every living ſyſtem of organs ſuppoſes mind, and indeed in the ſtudy of ſuch ſyſtems the phyſiologiſt muſt often meet with many phenomena that are leſs ſingular than ſimple perception, and yet for which he cannot account by any knowledge he poſſeſſes of organic powers. This truth we partly acknowledge, when, like ancient Athens erecting her altars to unknown gods, we retreat to thoſe aſylums of ignorance, the *vis inſita*, the *vis nervea*, the *vis vitalis*, the *vis medicatrix*, and a number of others of the ſame kind.

Phyſiology, in the general ſenſe in which we have defined it, is a ſcience that inveſtigates the nature and the functions of all living beings. It is, therefore, reaſonable to ſuppoſe that it muſt have an intimate connection with natural hiſtory, and in fact, it is to this branch of phyſics that it has been perhaps more indebted than to any other. A comparative view of the various gradations among organized beings has taught us to appreciate the value of the ſeveral functions that characteriſe vitality, and has ſhewn us, that in proportion as the ſtructure is more complex, the functions are more numerous, and more complete. Repeated obſervations, and multiplied experiments on various tribes of animated nature have cleared up many doubtful and obſcure phenomena in the economy of man, and a continuation of this truly philoſophical method of reſearch promiſes to place phyſiology on the ſolid baſis of experience, and enable us to reaſon, where only we can reaſon with ſafety, by a deduction from facts. The more numerous theſe facts, and the more complete their arrangement, the more extenſive, and the more ſecure will be the foundation which they afford for phyſiological concluſions. In ſhort (to uſe the language of Dumas, who has illuſtrated this relation at great length), "the phyſiologiſt who is converſant with natural hiſtory, is ſo much the better fortified againſt uncertain opinions, inaſmuch as he has more fully obſerved the operations of nature in connection and in detail. An hypotheſis which to others appears perfectly adequate to the object in view, is not convincing to him. He riſes above the particular object to which it is accommodated, in order to appreciate its value; and it is often among circumſtances which are foreign to the original ſubject, that he ſeeks for exceptions or contradictions that overturn the hypotheſis. Every thing that may ſerve to complete the knowledge

10 and natural hiſtory.

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knowledge of the animal economy enters into his plan; and as the nature of man is ſo much the leſs incomprehenſible as we employ a greater number of comparative ideas in its expoſition, it is doubtleſs in the power of natural hiſtory to elucidate that ſubject, by revealing a multitude of unknown relations between man and thoſe beings which reſemble or which differ from him*."

* *Dumas Principes de Phyſiologie*, tom. i. p. 231.

11 Importance and utility of phyſiology.

The importance and utility of phyſiology will ſcarcely be queſtioned, and need therefore but little illuſtration. To all who deſire to become acquainted with the operations that take place in the animal economy, or to trace the progreſs of vegetation, and examine the various changes produced on the ſeed or bud from the action of air, heat, and moiſture, (and what ſtudies can be more deſerving of a rational and an enlightened mind?) phyſiology muſt afford the moſt intereſting ſubjects of contemplation. To the anatomiſt and the botaniſt, it relieves the tedium of dry deſcription and ſevere claſſification; to the phyſician it holds out the ſureſt lights to direct his reſearches into the circumſtances that are favourable to life and health, into the nature and phenomena of death, and of courſe, the means of avoiding or delaying its attack; to the agriculturiſt it furniſhes ſome of the moſt certain principles to direct him (with the aid of chemiſtry) in the choice of ſoils, and the application of manures; while to the genuine naturaliſt, no ſubject preſents ſuch a field of amuſement and inſtruction. When it ſhall have been rendered as complete as the ſtate of contemporary ſcience will allow, it will exhibit the general reſult of all thoſe experiments and obſervations that have purpoſely been made to illuſtrate the phenomena of animated matter, or have accidentally contributed to that illuſtration; and when it ſhall reach that ſummit of perfection to which the efforts of genius may carry it, it may diffuſe a light, of which at the preſent day we can form no juſt or adequate conception. On many occaſions it may introduce order for confuſion, certainty for doubt; and may eſtabliſh ſcience, in various departments that are now occupied by fancy and conjecture.

After having pointed out the *nature*, *diviſions*, *relations*, and *utility* of phyſiology, it may not be improper to make a few remarks on the beſt methods of purſuing the ſtudy of it, and the works that are moſt worthy of a peruſal.

12 Methods of ſtudying phyſiology.

From what has been ſaid of the relations between phyſiology and other ſciences, it will be inferred that the ſtudent of our preſent ſubject ſhould come prepared with a moderate ſhare of knowledge in anatomy, both human and comparative, of chemiſtry, of mechanical philoſophy, eſpecially dynamics, optics, pneumatics, and acouſtics; and natural hiſtory, eſpecially zoology and botany. At leaſt the *rudiments* of theſe branches ſhould be well underſtood, and the ſtudent will then have laid a foundation on which to raiſe a firm and durable ſuperſtructure.

He has now to make himſelf acquainted with what is already known; and in this inquiry it is of much conſequence that he ſhould ſelect thoſe works that embrace the whole ſubject, without being too diffuſe on the one hand or too brief and general on the other. The *Elementa Phyſiologiæ* of Haller contains a maſs of information that will ever render it valuable as a book of reference, though it will ſcarcely at the preſent day be ſtudied as a ſyſtem of phyſiology. His *Primæ Lineæ Phyſiologiæ*, though firſt written, is chiefly a compendium of the larger work, and is better adapted to the general ſtudent, though, from its not containing the later diſcoveries in the ſcience, it is far from complete. The *Inſtitutiones Phyſiologiæ* of Blumenbach is a uſeful work, though it has now given place to the later and more accurate publications of Cuvier and Dumas. The *Anatomie Comparée* of the former writer contains an excellent digeſt of comparative phyſiology, and the preliminary obſervations prefixed to the anatomical details contained in this work, may be read with conſiderable advantage. Probably, however, the *Principes de Phyſiologie* of Dumas is the moſt perfect and ſcientific modern production that has appeared on the ſubject. We cannot ſay ſo much of the *Elements of Phyſiology* lately publiſhed by Richerand, and tranſlated into Engliſh by Mr Kerriſon; for although it contains conſiderable information, and a great diſplay of reading, and even of original obſervation and experiment, it is neither ſcientific nor always very accurate. The works of Bichat, eſpecially his *Anatomie Generale*, *Anatomie Deſcriptive*, and his *Recherches Phyſiologiques ſur la Vie et la Mort*, abound with excellent phyſiological remarks, and, allowing for the great extent to which he has carried ſome peculiar doctrines, are among the beſt that have appeared on the animal economy.

In our own country, we have many valuable treatiſes and papers on different parts of phyſiology, and the names of Hunter, Monro, Home, Cooper, Abernethy, Carliſle, Sanders, Barclay, Jones, and many others, will ever reflect honour on the country and on the age in which they lived. We can ſcarcely, however, point out a complete work in our language on the general ſubject of phyſiology, though we doubt not that many will be diſpoſed to conſider the *Zoonomia* of Dr Darwin as entitled to that appellation. We allow that this is a ſtupendous monument of the genius and induſtry of its author, and it contains an ample ſtore of valuable facts, which, if they could be diveſted of the hypotheſis with which they are ſo much blended, would be extremely uſeful to the cauſe of phyſiological ſcience. At preſent many of them tend to miſlead, by a ſhew of metaphyſical acuteneſs, and by the new ſenſe in which ſeveral terms are employed. Another of Dr Darwin's works, not leſs valuable, in a phyſiological point of view, is his *Phytologia*, in which he treats of the economy of vegetation with ability and ſucceſs.

13 Means of advancing and improving phyſiology.

He who is deſirous of advancing and improving the ſcience of phyſiology, muſt, in the firſt place, have recourſe to a patient, and, as far as may be, an accurate obſervation of the phenomena that take place in organized beings; but the multitude, the variety, and complicated nature of theſe phenomena, place in his way obſtacles that it is difficult to ſurmount. It is only through time, and patience, and aſſiduity, that he can attain his object; and it requires conſiderable dexterity and acuteneſs to detect the appearances under which theſe phenomena ſometimes preſent themſelves, to pierce through the obſcurity in which they are often involved, and to avoid, in a route ſo uncertain, both the illuſions of ſenſe and the errors of genius. The living body has properties peculiar to itſelf, while it alſo poſſeſſes others that are common to it with brute matter. The phenomena by which it manifeſts theſe two orders of properties, are therefore of two kinds, as they relate particularly

Introduction. larly to the ſtate of vitality, and as they are found in every object that exiſts. Theſe latter are ſubject to the general laws of matter, are confounded with the phenomena of univerſal nature, and may be denominated *phyſical phenomena*. Among the former, ſome are confined to the arrangement or diſpoſition of the parts in organs, and depend on the ſtructure or form of theſe organs. Theſe may be called *organic phenomena*. Others depend on the particular laws that govern vital beings, and are not the reſult of any peculiar organization; theſe are *vital phenomena*.

14 Obſervation. Obſervation alone is ſufficient to indicate the preſence or the exiſtence of theſe phenomena; but to unveil them fully there is required an unceaſing attention, that is reſolved to purſue them through the changes produced by age, ſex, climate, ſituation, and all thoſe circumſtances that can affect the living ſyſtem.

15 Experiment. To obſervation, he muſt add, wherever this can be done with a chance of accuracy, a patient inveſtigation of nature by experiment. From the experiments of Spallanzani and Stevens on digeſtion; of Goodwin, Menzies, Spallanzani, and Davy on reſpiration; of Monro, Galvani, Volta, and a hundred others on animal irritability, with many other experiments made both at home and abroad, more light has been thrown on the economy of living bodies, than by all the hypotheſes and theories that the moſt ingenious ſpeculatiſts have contrived ſince the firſt dawn of infant ſcience.

16 Cautions. In following out Bacon's great plan of obſervation and experiment, we muſt, however, take care in phyſiological, as in all other phyſical inquiries, not to be too haſty in our concluſions, and not to ſuppoſe that we have reached the bottom of the well of truth, when we have barely got within its verge. Further obſervations on this ſubject are unneceſſary here, as we have already treated it at ſome length in the articles PHILOSOPHY and PHYSICS.

17 Modern arrangements. We ſhall conclude theſe introductory remarks with a brief ſketch of the principal arrangements of modern phyſiologiſts, and a tabular outline of the ſubject as we propoſe to treat it in the following pages.

18 Two modes of arrangement. There are two modes of arrangement that have uſually been adopted in treating phyſiology; one according to the order of the functions, and another according to that of the organs by which theſe are performed. The latter of theſe was adopted by Haller; the former is that of Dumas, Cuvier, and moſt of our later phyſiologiſts.

19 Arrangement of Dumas. Dumas, after a long introductory diſcourſe, in which he treats of the beſt method of purſuing the ſtudy of anatomy and phyſiology, divides his ſubject into ſix parts. In the firſt of theſe he offers ſome general views reſpecting anatomy, phyſiology, and all the branches of phyſics which are employed in illuſtrating the nature and properties of organized and living beings. In this part he gives a compendious hiſtory of the progreſſive improvements in anatomy and phyſiology, points out the relations that take place between theſe ſciences, and the auxiliary branches of mathematics, mechanical philoſophy, chemiſtry, and natural hiſtory; he conſiders the principal differences that diſtinguiſh organized from inorganic matter; the nature, effects, and duration of life, and of the general and particular powers or faculties of nature, both in living and brute matter.

In the ſecond part he lays down the fundamental principles on which the phyſical conſtitution and particular economy of man depend; treats of man conſidered individually; of his formation, ſtructure, and varieties; of the modifications produced in the nature of man by age, ſex, habit, and temperament; of the relations between man and external objects; of the action and reaction of the organic ſyſtems on each other; of the organic ſtructure of man, and of its ſeveral varieties in the different parts and organs; of the natural compoſition of the different fluids and ſolids of the human body: and gives a methodical diviſion of the functions, with a critical examination of the modes of claſſification commonly received.

In the third part he treats of the phenomena of the animal economy, in the relation which they bear to the perpetual commerce eſtabliſhed between man and the organs that ſurround him, or of *ſenſation* and *motion*. Here he conſiders the action of external objects upon man, whence reſult the phenomena of ſenſation, and the action of man on external objects, from which ariſe the phenomena of motion.

In the fourth part he treats of the phenomena of the animal economy, in the relation which they bear to the conſiſtence of the fluids, the coheſion of its ſolids, and the temperature of the whole ſyſtem. Here he conſiders the mutual action between the veſſels and the blood, from which reſult, both in the ſolids and fluids, that degree of coheſion and pliability that favours the neceſſary expanſibility of the living body, or the function of circulation; the action of the air, and of caloric, on the ſolids and fluids, from which reſults the degree of expanſion neceſſary to life, or the function of reſpiration.

In the fifth part he treats of the phenomena of the animal economy in the relation which they bear to the healthy and entire ſtate of the material ſubſtance and compoſition of the body. Here he conſiders the action of alimentary ſubſtances on the human body, in repairing its loſs, and preſerving its ſubſtance, from which reſult the phenomena of digeſtion, abſorption, and nutrition; and of the action of certain organs on the fluids of the body, in ſeparating thoſe which do not ſerve the purpoſes of nutrition, from which reſult the phenomena of ſecretion and excretion.

In the ſixth and laſt part, he treats of the phenomena of the animal economy in the relation which they bear to the commerce eſtabliſhed between the individual and the ſpecies. Here he conſiders the mutual phyſical action of the two ſexes, from which ariſe the phenomena of generation; and the mutual moral action of ſeveral individuals, from which reſult the phenomena of ſpeech, and mutual intelligence.

From this ſketch of the arrangement of Dumas it will be ſeen, that although he takes a very extenſive view of the ſubject, his obſervations are chiefly confined to the human body.

Though the lectures of Cuvier do not contain a complete ſyſtem of phyſiology, the anatomical matter in them is, however, ſo much blended with obſervations on the animal economy, that it will be of importance for the phyſiological ſtudent to be acquainted with his arrangement. 20 Arrangement of Cuvier.

The whole work is divided into 30 lectures: the firſt of which is occupied with preliminary obſervations on the animal economy, comprehending a general view of the functions of animal bodies; a general idea of the organs of which the animal body is compoſed; a view of

of the principal differences exhibited by theſe organs, and of the relations which exiſt among thoſe variations, together with a diviſion of animals founded on their organization. The ſecond lecture treats of the organs of motion in general; the third, fourth, fifth, and ſixth lectures are merely anatomical, exhibiting a comparative view of theſe organs in the ſeveral claſſes of animals. The ſeventh lecture is ſtrictly phyſiological, and treats of the organs of motion conſidered in the ſeveral actions of ſtanding, walking, ſeizing and climbing, leaping, ſwimming, and flying.

The eighth, ninth, tenth, eleventh, twelfth, thirteenth, fourteenth, and fifteenth lectures, are occupied in conſidering the anatomy and phyſiology of the function of ſenſation. Of theſe, part of the ninth treats of the nervous ſyſtem in general, and of its action; part of the twelfth gives the phyſiology of viſion; part of the thirteenth, that of hearing; part of the fourteenth, that of touch; and part of the fifteenth, that of ſmell and taſte.

The ſixteenth, ſeventeenth, eighteenth, nineteenth, twentieth, and twenty-firſt lectures treat of the organs and phenomena of digeſtion, maſtication, inſalivation, and deglutition. The twenty-ſecond lecture treats of what have been called the aſſiſtant chylopoietic viſcera, namely, the liver, the pancreas, the ſpleen, and their offices. The twenty-fourth treats of the organs and phenomena of circulation in general; the twenty-ſixth of thoſe of reſpiration in general; the twenty-eighth of the organs of voice.

The twenty-ninth treats of the organs and phenomena of generation, and the thirtieth, of thoſe of excretion, comprehending a general view, both of ſecretion and excretion.

21 Of Bichat.

Subjoined to Bichat's introduction to his *Anatomie Generale*, there is a tabular view of phyſiology, in which, after ſome preliminary outline of the general ſtructure of the organs and of the phenomena of vitality, he divides the functions into claſſes, orders, and genera.

The firſt claſs conſiſts of the functions that relate to the individual; the firſt order of which, compriſing the functions of *animal life*, comprehends five genera, viz. *ſenſations, cerebral functions, locomotion, voice*, and *nervous tranſmiſſion*, beſides *ſleep*. The ſecond order of this claſs contains the functions of *organic life*, and comprehends eight genera, viz. *digeſtion, reſpiration, circulation, exhalation, abſorption, ſecretion, nutrition*, and *calorification*.

The ſecond claſs contains the functions that relate to the ſpecies in general, and is divided into three orders. The firſt of theſe, compriſing the functions peculiar to the male, comprehends only one genus, viz. the *production of the ſeminal fluid*. The ſecond compriſes the functions peculiar to the female, and contains three genera, viz. *menſtruation, the production of milk*, and *of the female generative fluids*. The third order compriſes the functions that relate to the union of the two ſexes, and the product of that union; and it comprehends alſo three genera, viz. *generation, geſtation*, and *delivery*.

Reſpecting the peculiar doctrines of this writer we ſhall ſpeak hereafter.

22 Zoological arrangement.

There is ſtill another mode of arranging the phenomena of living bodies, that deſerves to be noticed, namely, that in which they are arranged according to the artificial ſyſtems of natural hiſtory. This mode of arrangement, though of infinite advantage to the zoologiſt, by ſhewing him at once the extent of his ſubject, and giving to his memory a power of recollection which it could not otherwiſe poſſeſs, is yet not ſuch as the phyſiologiſt would wiſh to be obſerved. Zoological arrangements are uſeful chiefly as they facilitate the ſtudy of the manners, diſpoſitions, and habits of different animals; and all that part of the outward economy which indicates ſomething of the wiſdom and deſign diſplayed by the Creator, in their ſtructure and adaptation to the modes of life which they are intended to purſue; but they do not ſufficiently illuſtrate the internal ſtructure on which this outward economy depends, nor do they ſufficiently explain the more ſecret functions, which being independent of the will of the creature, only diſplay the power and omniſcience of him who made it. This will be readily conceived from conſidering the difference between zoology and phyſiology, as we have defined it. Zoology is chiefly led to examine the animal kingdom as it uſually preſents itſelf to the eye, including a great variety of objects; phyſiology examines only that part of the animal economy which is principally made known by anatomy and chemiſtry. Zoology has been accuſtomed to divide its kingdom into ſo many claſſes or orders of animals; phyſiology would naturally divide its economy into ſo many functions. Zoology has uſually ſubdivided its claſſes by certain obvious external marks, as the teeth and claws; phyſiology would naturally ſubdivide its functions by the varieties of thoſe organs which are deſtined to perform them, as the ſeveral kinds of lungs and ſtomachs. Zoology mentions the functions only in a curſory manner, as forming a part of the hiſtory of animals; phyſiology takes notice of animals, only when they are of uſe to illuſtrate the functions. To theſe differences we may add another; that phyſiology, in the extended ſenſe which we have given it, goes beyond zoology in comprehending the economy of the vegetable creation. From this compariſon it will be admitted, that things which are primary in a zoological method, will often be ſecondary in a phyſiological arrangement, and *vice verſa*. This is very conſpicuouſly the caſe in one of the grand diviſions of Linnæus, viz. mammalia, where the important ſecretory organs of the milky fluid are noticed only like the colour of the hair, or the length of the tail, as a good outward mark of diſtinction, and likewiſe in the excellent table by D'Aubenton in his introductory view of natural hiſtory, in the *Encyclopédie Methodique*, in which the function of digeſtion is not even mentioned.

23 Utility of the application of phyſiological to zoological arrangement.

It is, however, extremely uſeful, both to the naturaliſt and phyſiologiſt, that the arrangements of both ſciences ſhould be, as far as poſſible, adapted to each other, by marking the relative importance of the ſeveral functions in the various claſſes of living beings. This has been very ably performed by Vicq d'Azyr, a modification of whoſe table has been given in the comparative part of our ANATOMY. See Vol. II. p. 280.

24

With reſpect to all phyſiological arrangements we may obſerve, that as the phenomena of living beings are ſo intimately dependent on each other, as to form the links of one continued chain, it is of little conſequence which of the functions or phenomena we make the point from which we ſet out in our examination. But as the organs of ſenſation in moſt animals, and thoſe of digeſ-

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tion in almoſt all living creatures, are among the firſt that are evolved, it appears moſt convenient to begin with one of theſe. The following is the arrangement that we ſhall adopt in the preſent article.

25 Arrangement of the preſent article.

After giving a ſketch of the progreſs of phyſiological diſcoveries and opinions, we ſhall divide the remaining part of the article into 16 chapters. In the firſt of theſe we ſhall treat of the characteriſtic marks, general phenomena, duration, and principle of life. In the ſecond we ſhall conſider the phenomena of ſenſation, the action of the nervous ſyſtem, and the external ſenſes of feeling, taſting, ſmelling, hearing, and ſight. In the third and fourth chapters we ſhall treat of irritability, and the phenomena of motion. In the fifth we ſhall treat of digeſtion; in the ſixth of abſorption; in the ſeventh of circulation; in the eighth of reſpiration and voice; and in the ninth of nutrition, as completed by the ſucceſſive performance of the four preceding functions. In the tenth chapter we ſhall treat of the phenomena of ſecretion; and in the eleventh, of thoſe of excretion. In the twelfth we ſhall conſider the various means by which living beings defend themſelves from external injury, or the phenomena that attend the evolution and change of the integuments, to which function we ſhall give the name of *integumation*. In the thirteenth chapter we ſhall conſider the transformations that take place in ſome tribes of living beings, eſpecially inſects and reptiles. In the fourteenth we ſhall briefly examine the phenomena of reproduction, and the hypotheſes to which they have given birth. In the fifteenth we ſhall conſider the nature of ſleep, and the phenomena of dreams; and in the ſixteenth we ſhall terminate our inquiries by a few obſervations on the nature and phenomena of death.

The following table is intended to exhibit an outline of the principal circumſtances attending the phenomena of life, in the order in which we have enumerated them.

26 Tabular outline.

1. LIFE—is either	Univerſally diffuſed through the body. *Polypi*, &c.
	Moſt concentrated in certain organs.
	Continued for only a few hours. *Ephemeræ, and ſome other inſects.*
	———— about a year. *Annual plants.*
	———— two years. *Biennial plants.*
	———— ſeveral years. *Perennial plants, and moſt animals.*
	———— about a century. *Elephants, pikes*, &c.
	———— ſeveral centuries. *Oaks, cheſnuts*, &c.
2. SENSIBILITY—Appears to	Exiſt in a very low degree in plants. *Senſitivity.*
	Exiſts in a greater or leſs degree in all animals.
	Confined to the ſenſes of feeling and taſte. *Moſt zoophytes.*
	Extended beſides theſe to the ſenſes of ſmelling, ſight, and hearing.
	Appears farther extended by an additional ſenſe. *Bats.*
3. IRRITABILITY—Affected by	Stimulants inviſible.
	———— unknown.
	———— unthought of.
	The nervous influence.
	Light.
	Heat.
	Moiſture.
	Electricity.
	Salts.
	Gaſes.
	Bodies that act mechanically.
4. MOTION—Performed by	Legs.
	Wings.
	Fins.
	The tail.
	Organs which fall not properly under theſe deſcriptions, *bats, flying opoſſums*, &c.
	The ſpringineſs of the body or of ſome part of it, *maggots, fleas*, &c.
	Contrivances which fit living bodies for being moved by foreign agents.

5. DIGESTION—

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5. Digestion— Performed by an alimentary canal.

- Without teeth.
- With teeth in the mouth.
- ——— in the ftomach.
- ——— ftones or artificial teeth in the ftomach.
- ——— glands in the mouth for fecreting a liquor to be mixed with the food.
- ——— pouches in the mouth where the food is kept and moiftened.
- ——— a fac or bag where the food is kept and moiftened.
- ——— a membranous ftomach.
- ——— a mufcular ftomach.
- ——— an intermediate ftomach.
- Without a cœcum or blind gut.
- With a cœcum. ⎫
- ——— two cœca. ⎬ Thefe parts, as well as ruminating ftomachs and their œfophagus, have antiperiftaltic motions.
- ——— three cœca. ⎪
- ——— four cœca. ⎭
- ——— one entrance or mouth.
- ——— many entrances by abforbents.
- Plants have many alimentary canals.
- Some polypes have alimentary canals that branch through the body.
- The alimentary canals of plants and worms diftribute the fluids without the aid of a circulating fyftem.

6. Absorption— Performed by

- Veffels beginning from the alimentary canal.
- ——— the cavities.
- ——— the furface.
- Veins in the penis and placenta.
- Re-abforbents originating from all the parts of the fyftem.

7. Circulation— Performed by a fyftem with

- One heart.
- A heart for diftributing the blood through the refpiratory organs, and an artery for diftributing it through the fyftem.
- One heart for the refpiratory organs, and one for the fyftem, both in one capfule.
- Two hearts for the refpiratory organs, and one for the fyftem.
- A pulmonary heart, or a heart for the refpiratory organs in the courfe of circulation.
- A pulmonary heart within or without the courfe of circulation at pleafure.
- A heart fituated in the breaft.
- ——— near to the head.
- ——— in the oppofite extremity.
- Some animals and all plants have no circulating fyftem.

8. Respiration— Performed by organs.

- Diffufed through the fyftem.
- Confined to one place.
- Situated externally.
- ——— internally.
- In the courfe of the circulation.
- Not in the courfe of the circulation.
- Within or without the courfe of circulation at pleafure.
- Without tracheæ.
- With tracheæ ramified through the fyftem where the refpiratory organs are generally diffufed.
- ——— not ramified through the fyftem where the refpiratory organs are confined.
- ——— formed by rings.
- ——— by fegments of rings on one fide, and a membrane on the other.
- ——— by continuous rings running fpirally like a fcrew.
- ——— admitting air by one entrance.
- ——— by feveral entrances.
- ——— wholly concealed in the body.
- ——— partly projecting from the body.
- ——— opening at the head.
- ——— at the oppofite extremity.
- ——— upon one fide.
- ——— both fides.

Nutrition—

9. Nutrition—Food prepared by
- The alimentary canal.
- The lacteals.
- The reſpiratory organs.
- The circulating ſyſtem.
- The cellular membrane.
- The glands.
- And by the ſeveral parts in which it becomes finally aſſimilated.

10. Secretion—Performed by
- Veſſels.
- Exhaling veſſels.
- Excretory organs.
- Organic pores.
- Glands.
- And by all the parts of which the ſyſtem is compoſed.

11. Excretion—Excrementitious matters thrown out by
- The integuments chiefly.
- The common opening of the alimentary canal.
- Two openings of this tube.
- By the lungs and other emunctories.

12. Integumation—Some living bodies have integuments which are
- Scaly.
- Shelly.
- Membranous.
- Corneous.
- Cretaceous.
- Ligneous.
- Covered with down.
- ——— hair.
- ——— prickles.
- ——— feathers.
- ——— a viſcid matter.
- Change their colour.
- ——— their covering.
- Changed themſelves.

13. Transformation—Takes place
- By a change of proportion among the parts.
- ——— of their form.
- — throwing off old parts.
- — an addition of new ones of a different uſe, ſtructure, and form.
- — a change of the whole form together.
- ——— of qualities, propenſities, manners.

14. Generation—Performed by
- The temporary union of two ſexes.
- The ſpontaneous ſeparation of parts.
- Organs ſituated in the breaſt.
- ——— in the ſide.
- ——— near to the head.
- ——— in the oppoſite extremity.
- An intrant organ of the male, and a recipient organ of the female.
- An intrant organ of the female, and a recipient organ of the male.
- The ſtamina and piſtils of flowers.
- The ſeminal ſecretion of the male thrown into the organs of the female.
- ——— ſprinkled at the entrance of the female organs.
- ——— thrown upon them from a diſtance.
- ——— tranſported to them by the winds.
- ——— ſprinkled on the embryo after emiſſion.
- ——— diſſolved in a fluid ſecreted by the female before it can rightly perform its office.
- ——— diſſolved perhaps ſometimes in air, as in the caſe of dioicous plants, where it probably acts like an aroma.

15. Sleep—Natural ſleep is occaſioned by
- Quietneſs.
- The abſence of ſtimuli.
- The ſameneſs of ſtimuli when long continued.
- Deficient aſſimilation.
- Deficient irritability, which is owing ſometimes to the weakneſs, inattention, or confined powers of the mental principle.

16. Death. See Life.

The

HISTORY.

27 Utility of the history of physiology.

THE early history of physiology can be little more than an account of the opinions of the ancient philosophers respecting the nature and functions of the human body; but as their opinions reflect considerable light on the progressive improvement of the philosophy of man, the history of physiology, even in its early stages, is curious and interesting.

28 Opinions of Pythagoras respecting man.

Of the origin of physiology as a science we know nothing. On examining the writings of the earliest philosophers, we meet with little more than a collection of abstract principles and hypothetical reasonings, especially previous to Pythagoras. He considered man as a microcosm, or an epitome of the universe, in which were produced the same phenomena as in the larger world, only to a less extent. He admitted more than one intelligent principle, conducting all the operations of the human body. He supposed that the human soul, nourished by the blood, fixed by the veins, the arteries, and the nerves, as so many visible situations, became obedient to the general laws of universal harmony. He did not pretend that the eternal power of numbers had prescribed all the phenomena of nature, and that the force of numerical harmonies regulated the motions of the bodies which filled the universe, though he has been made so to express himself by his disciples. He was contented with asserting, that every thing in nature was brought about according to the qualities and proportions of numbers, without attributing to them an intrinsic virtue and a positive existence. He perceived that the phenomena of the animal economy succeeded each other with a strict regularity, by which they concurred in maintaining order; and in this order he found the principle of the existence and preservation of all beings; a principle without which they could not exist. He considered the souls of men as emanations from the general soul of the universe, or *anima mundi*.

29 Of Alcmæon.

Alcmæon considered the brain as the seat of the soul. He supposed sound to be produced by the reverberation of the air within the cavity of the ear; and he thought that taste was owing to the moisture of the tongue. He compared the body of a fœtus to a sponge, which obtained its nourishment by the suction established over every part of its substance. According to him, the motion of the blood was the essential principle of life; and he supposed that the stagnation of this fluid in the veins produced sleep, and its active expansion brought back the waking state of the body. Health consisted in the equilibrium and well proportioned mixture of certain primary qualities; and that whenever any of these became too predominant, disease was the consequence.

30 Of Empedocles and Anaxagoras.

Empedocles involved himself in a multitude of absurd hypotheses, in order to explain the formation of man, and the combination of the elements from which he was produced. He too, like the disciples of Pythagoras, sought among the properties of numbers, for the general principles both of physical and moral science. In uniformity with this system it was, that he reckoned the four elements, and admitted among the particles of these material principles a kind of affection and aversion, of desire and antipathy, capable of separating and reuniting them, as occasion might require. He believed that respiration commenced within the *uterus*, where the infant was provided from each parent with certain organic particles, which tended to unite into one uniform whole. Anaxagoras, convinced that we must attribute the arrangement of matter to the intelligence of a superintending being, imagined that the body of every animal was formed of homogeneous particles, which were brought together by a sort of affinity. It appeared to him, that bodies which were endowed with thought, were composed of sensible elements; that these elements remained unalterable, and that no power in nature could exert any action on them.

31 Democritus.

Democritus dedicated his life to repeated experiments on plants and animals. He explained the principal phenomena of organized bodies by the action and reaction of atoms, which he supposed to be endowed with powers essentially active, and susceptible of repelling and attracting each other. According to him, generation consisted in the cohesion of homogeneous atoms. He conceived the heat inherent in the elements of the body to be the sole active principle with which man was animated; and that by increase of this he became capable of life and motion. He compared the organs of the senses to mirrors, on which were painted the images of things, and he reduced all sensations to the sense of feeling, which he supposed to be more or less delicate according to circumstances.

32 Hippocrates.

These philosophers, who lived before the time of Hippocrates, had, as we see, but very rude and indistinct notions of the animal economy; nor were those of the great father of physic much superior. Excellent as was his practice, and acute his knowledge of the symptoms and progress of diseases, the physiology of Hippocrates was very lame and defective. He seems, indeed, to have understood the function of nutrition better than most others; he traces the aliment into the stomach, seems aware of the processes it has to undergo there, and hazards a conjecture that part of the chyle is taken up immediately by the pores of the cellular texture; and that the juices admitted into this membrane, served for the production of milk, the matter of which is afterwards transported, and laid up within the breasts. He attributes to each vital part an attractive force, which it exerts on the nutritious particles, in order to incorporate and appropriate to itself those which bear to it a certain analogy. He thought that the heat generated in a living body was kept up entirely by the powers of vitality; and that the external air introduced by respiration, served rather to check it, by exerting a cooling effect on the pulmonary organs. He represents the human body as agitated in all its parts by an alternate flux and reflux, which carried the matters from within outwards, or brought them from without inwards. From this some have supposed that he understood the circulation of the blood, a supposition made two hundred years ago, and lately again brought forward by the French physiologists. We shall not at present stay to canvass this opinion, which, however, we conceive to be founded on very unsatisfactory arguments.

33 Plato.

After Hippocrates, the science of man was again left to the schools of philosophy, from which he had first separated it. Plato is the first philosopher whose opinions merit particular notice. He wrote on the physiology of man with his accustomed elegance and splendour of diction; and he assumed the tone of an inspired prophet in describing, with the force of enthusiasm, the grand images that suggested themselves to his mind. According

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cording to him, the human body does not contain within itſelf the cauſe of the phenomena which are the conſequence or the attendants of life. It is only a paſſive ſubject, on which the ſoul expreſſes the ſeries of its functions, like the canvas on which the painter traces the conceptions of his inventions. He diſtinguiſhes two principles of action in man, a rational ſoul, on which depend reflection and intelligence, and an irrational ſoul, on which depend life and motion. The latter is diffuſed through every part of the body; and it is by means of theſe parts that it feels, ſuffers pain, or enjoys pleaſure. Thus it is by means of the heart it is ſuſceptible of courage and of paſſion; by the liver of deſire. The head is the ſeat of reaſon; the cheſt, and eſpecially the heart, the ſeat of ſtrength and anger; the lungs, the general coolers of the body. One diviſion of the irrational ſoul, which poſſeſſes an appetite for food, and all the neceſſary refreſhments of the body, reſides in the epigaſtric region; which, in the language of Plato, is a ſort of ſtable, in which reſides a voracious animal. During nutrition, the vital parts aſſimilate to their ſubſtance the aliments which are preſented to them; and this aſſimilation is the conſequence of an affinity that takes place between theſe parts and the nutritious juices. He thus ſeems to regard nutrition as the effect of a combat between the aliments and the parts of the animal. A young animal will receive more nouriſhment than one which is old, becauſe the force of its body has more effect in overcoming the force of the nutritious ſubſtances.

As the reciprocal action of the ſoul and the body on each other did not appear to him capable of being explained on the ſuppoſition of immateriality, he propoſed the idea of a *plaſtic nature*, which he ſuppoſed to be an intermediate principle connecting the ſoul and the body.

The human body, which is entirely ſpongy, is expoſed through every part to oppoſite currents of air and fire, which traverſe and penetrate it, being introduced alternately by the lungs and by the ſkin. Hot, cold, denſe, rare, and the other ſenſible properties of bodies, are only the cauſes of the phenomena which we perceive, and are, as it were, the occaſions or accidents that are required to keep in play the intelligent force diſſeminated through nature.

34 Ariſtotle.

Ariſtotle, the diſciple of Plato, for a long time diſputed with him the palm of genius and celebrity; but, as his phyſiological doctrines differed very little from thoſe of his maſter, it is unneceſſary to detail them, except to remark, that he attributed to the ſoul three faculties, a *nutritive*, a *ſenſitive*, and a *rational* faculty; in the firſt of which life is the only principle; in the ſecond, feeling is produced; and the third is peculiar to man, and is that part of him which knows or judges. This part is either an active or a paſſive intellect, of which the firſt may be ſeparated from the body, and is immortal; whereas the ſecond periſhes together with the body. Life, according to this philoſopher, is a permanence of the ſoul, retained by the natural heat, the principle of which reſides in the heart.

About the period which we are now conſidering, philoſophy was divided into two ſects; the materialiſts, who attributed the formation of all beings to the fortuitous concourſe of atoms; and the ſpiritualiſts, who held that the ſoul enjoyed an exiſtence anterior to that of the body, which was no other than a paſſive organ, in which the phenomena that previouſly exiſted in the ſoul, in an abſtract, latent manner, became evident and ſenſible. To the former ſect belonged Democritus and Epicurus; to the latter, Zeno and Plato.

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The profeſſors of the Alexandrian ſchool, though they did much for the improvement of anatomy, added little to phyſiology. Of theſe Herophilus brought to ſome degree of perfection the doctrine of the pulſe, and ſeems to have underſtood the action of the pulmonary organs more correctly than his predeceſſors, attributing to them a ſort of natural appetite, by which they attracted and rejected the matter of reſpiration. He conſidered the nerves, the muſcles, and the arteries, as the moving powers of the body. 35 Herophilus.

In Galen, alſo a diſciple of this ſchool, we find the moſt ſcientific phyſiologiſt that has yet come under our notice. He ſeems firſt to have aſcertained by experiment, that the arteries contain blood, and not air, as had been the opinion of Herophilus and his predeceſſors; and that they poſſeſſed a moving force, independent of that which the heart exerciſes on the maſs of blood, and he found that the contraction of the heart always alternated with a proportional dilatation. He even tried ſome delicate experiments, in order to aſcertain the influence of the nervous ſyſtem upon the ſenſitive and motive powers of the body, by which he found, that when a nerve was intercepted with a ligature, the part to which it led became deprived of ſenſe and motion. He believed that the ſtomach, in a ſtate of contraction, applied itſelf to the aliment that had been taken in; that the meſenteric veins abſorbed a portion of the chyle prepared in the inteſtines; that the *ductus choledochus* carried the bile from the gall bladder into the duodenum; that the kidneys ſeparated a part of the urine; and he ſuppoſed, that another part of this fluid paſſed immediately from the ſtomach to the bladder, through ſome unknown paſſage. He believed that the lungs tranſmitted to the blood contained within them, an aerial principle, deſtined to free them from fuliginous vapours, and to temper the exceſs of heat generated within the body. The obſcure function of generation did not entirely eſcape his reſearches; and he made ſome curious attempts to find out how the ſexual organs prepared the ſeminal fluid, and how this acted in reproduction. 36 Galen.

For more reſpecting the doctrines of Galen, ſee the Hiſtory of Medicine.

The commencement of the 13th century is the epoch of a material revolution in phyſiology. Chemiſtry having penetrated into Europe, ſoon exerted its influence on moſt of the ſciences, and eſpecially on thoſe connected with medicine, the doctrines of which were totally changed from their ancient ſimplicity, and became a farrago of the moſt wild and fanciful opinions. The Peripatetics and the Galeniſts ſunk into oblivion; and the primitive qualities and occult faculties of the ancient ſchool gave way to the fermentations and efferveſcences of the chemiſts. Albertus Magnus and Roger Bacon, when they introduced the ſcience of chemiſtry, ſcarcely dreamed of applying it to medicine; but Arnoldus de Villa Nova undertook this application, and fought for the foundation of medical theory amid the proceſſes of his laboratory. Paracelſus followed, and ſurpaſſed him in this chemical delirium. An enlightened chemiſt and a credulous 37 The chemiſts

History. credulous astrologer, his head burning with the fire of his furnaces, and his imagination filled with magical reveries, he believed himself capable of constructing a new system of philosophy, from examining the course of the stars, and the products of his alembics. With the daring assurance of inspiration, he declared man to be composed of sulphur, mercury, and salt; and, having traced the origin of all diseases to certain chemical operations, he flattered himself, that by means of his arcana he could preserve health, and prolong, to an indefinite extent, the natural duration of human existence.

38 Van Helmont. Van Helmont, the disciple of Paracelsus, not less fanciful, but more scientific than his master, saw the necessity of something more than chemical principles to explain the functions of the animal machine. He therefore introduced his *archæus*, an intelligent being who established his throne in the epigastric region, having several subaltern ministers under him, who presided over the several functions of the body, and whose chief seats were, the head, the chest, and the belly.

39 Des Cartes. In the philosophy of Des Cartes, the separate existence of the vital principle is entirely rejected. He availed himself of the progress that had been made by Willis, and some other anatomists, in the investigation of the nervous system, to form an hypothesis of the vital functions, founded on the supposition of the nervous fluid, or what was then called the *animal spirits*; and this nervous fluid was assumed independently of the sensitive soul, to explain the appearances of sensation and voluntary motion.

The discovery of the valves in the veins by Fabricius; of the lymphatics by Rudbeck and Bartholin; of the lacteals by Asellius, and of the circulation of the blood by Harvey, all of which took place during the 17th century, gave to physiology an interest and a clearness which it never possessed before that period. Some account of the discoveries in the circulating and absorbing systems, hath been already given under ANATOMY; but as these discoveries have been productive of great advantages, both in general physiology, and in medicine, it will be worth while briefly to trace their origin and progress.

40 Discovery of the circulation. To begin with the circulation of the blood. Hippocrates speaks of the usual and constant motion of the blood, of the veins and arteries as the fountains of human nature, as the rivers that water the whole body, and which if they be dried up man dies. He says, that the blood-vessels are, for this reason, everywhere dispersed through the whole body; that they give spirits, moisture, and motion; that they all spring from one; and that this one has no beginning and no end, for where there is a circle there is no beginning. In such language was the prince of physicians accustomed to express his vague ideas of a circulation; for so far was he from having acquired accurate conceptions on this subject, that when he saw the motions of the heart, he believed that the auricles were two bellows to draw in air, and to ventilate the blood.

When after his time anatomy came to be more studied, the notions of the ancients respecting the blood were better defined; and, however chimerical they may seem to us, they were partly derived from dissection and experiment. On opening dead bodies, they found that the arteries were almost empty, and that very nearly the whole of the blood was collected in the veins, and in the right auricle and ventricle of the heart. They therefore concluded that the right ventricle was a sort of laboratory; that it attracted the blood from the cavæ; by some operation rendered it fit for the purpose of nutrition, and then returned it by the way that it came. From the almost empty state of the arteries, they were led to suppose that the right ventricle prepared air, and that this air was conveyed by the arteries to temper the heat of the several parts to which the branches of the veins were distributed.

To this last notion, entertained by Erasistratus, Galen added an important discovery. By certain experiments, he proved, that the arteries contained blood as well as the veins. But this discovery was the occasion of some embarrassment. How was the blood to get from the right to the left ventricle? To solve the difficulty in which his new discovery had involved him, he supposed that the branches of the veins and arteries anastomosed; that when the blood was carried to the lungs by the pulmonary vein, it was partly prevented by the valves from returning; that therefore during the contraction of the thorax it passed through the small inosculating branches to the pulmonary vein, and was thence conveyed along with the air to the left ventricle to flow in the aorta. This opinion, so agreeable to fact, unfortunately afterwards gave place to another that was the result of mere speculation. This notion was, that the left ventricle received air by the pulmonary vein; and that all its blood was derived through pores in the septum of the heart.

The passage through the septum being once suggested, and happening to be more easily conceived than one through the lungs, it was generally supposed the only one for a number of centuries; and supported likewise, as it was thought, by Galen's authority, it was deemed blasphemy in the schools of medicine to talk of another. In 1543, however, Vesalius having published his immortal work upon the structure of the human body, and given his reasons in the sixth book why he ventured to dissent from Galen, he particularly shewed how it was impossible that the blood could pass through the septum of the heart. His reasoning roused the attention of anatomists; and every one grew eager to discover the real passage which the blood must take in going from the right to the left ventricle. The discovery of this was first made by Michael Servede, a Spanish physician, who published his opinion in 1553. He expressly says, that the blood does not pass through the septum of the heart, as is commonly believed, but is conveyed by an admirable contrivance from the right ventricle of the heart, by a long passage through the lungs. This opinion was deemed heretic, and Servede's book was suppressed by public authority. Soon after, however, the same discovery was made by Realdus Columbus, an Italian professor, who published his account in 1559. It farther appears, that Andreas Cæsalpinus, who published in 1571, and again in 1593, was acquainted, not only with the lesser circulation, but observed, that the blood sometimes flowed from the branches of the veins towards their trunks; and that when a vein was tied with a ligature, it swelled between the ligature and the distant extremity of the vein, and not between the ligature and the heart. He thence inferred, that the veins and arteries opened into each other, and ventured to assert

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fert that the blood could not return by the arteries to the left ventricle of the heart. He did not, however, difcover the true circulation, but moft unaccountably maintained with Ariftotle, of whom he was a zealous difciple, that the blood flowed like the tides of Euripus, backward and forward in the fame channel, and fuppofed that it flowed from the arteries into the veins during fleep, and back again from the veins into the arteries till the waking ftate.

In 1574, Hieronymus Fabricius ab Aquapendente, while he was feeking for a caufe by which to explain the various fwellings of fome veins, which had arifen from friction and ligature, he, to his great joy and aftonifhment, difcovered their valves in one of his diffections; and here again the true theory of circulation feemed almoft unavoidable. Yet whoever reads the fmall treatife De Venarum Oftiolis, firft printed by Fabricius in 1603, will foon perceive that he was as far from entertaining a juft notion of the circulation as his predeceffors. Notwithftanding all that he faw, he ftill was of opinion that the blood flowed from the heart to the extremities even in the veins. He thought that the valves were intended by nature only to check and moderate its force. He calls them an inftance of admirable wifdom, and miftakes his own awkward conjecture for one of the defigns of infinite intelligence. In another refpect, it muft be confeffed that he bore no inconfiderable fhare in promoting the difcovery of the circulation. By writing on the valves, the formation of the fœtus, and chick in ovo, he directed the attention of his pupil Harvey to thofe fubjects where it was likely that the motion of the blood would frequently occur.

Harvey, who was born in 1578, and graduated at Padua in 1602, examined the valves with more accuracy than Fabricius, and explained their ufe in a treatife which he publifhed foon after his graduation. In 1616, he taught the true doctrine of the circulation in his lectures, and publifhed on the fubject in 1628. He was the firft author who fpoke confiftently of the motion of the blood, and who, unbiaffed by the doctrine of the ancients, drew rational conclufions from his experiments and obfervations. His books prefent us with many indications of a great mind, acute difcernment, unwearied application, original remark, bold inquiry, and a clear, forcible, and manly reafoning; and every one who confiders the furprife which his doctrine occafioned among the anatomifts of thofe days, the ftrong oppofition that it met with from fome, and the numerous and powerful prejudices which it had to encounter from the fanction of time and of great names, muft allow it was new; and that the author has from its importance, a title to rank in the firft clafs of eminent difcoverers, ancient or modern.

We have been the more particular in tracing the progreffive difcovery of the circulation, and in attempting to fhew that the real merit of the difcovery is due to Harvey, becaufe both the abilities and the originality of this eminent man have been called in queftion by his countryman Dr William Hunter; and many hints are given in the writings of fome foreign phyfiologifts, that the circulation was at leaft gueffed at by Hippocrates and other ancient writers.

We fhall be lefs minute in tracing the difcovery of the lymphatic fyftem, becaufe this has been related more at large in the article ANATOMY.

We learn from Galen, that certain veffels had been feen in kids by Erafiftratus, which appear to have been lacteals, though he called them arteries. Thefe lacteals were, however, firft accurately diftinguifhed in 1622, by Afellius, who printed his account in 1627. In 1651, Pecquet publifhed his account of the thoracic duct, which appears, however, to have been feen before by Euftachius. In 1653, Bartholin publifhed on the lymphatics, which had been fome time before difcovered by Rudbeck. In 1654, Gliffon afcribed to thefe veffels the office of carrying back the lubricating lymph from the arteries into the blood, or confidered them as aborbents. In 1664, the valves of thefe veffels were difcovered by Swammerdam, and a year after, an account of them was given by Ruyfch. The further difcoveries of Nuck, Nouges, Warton, Steno, Hunter, Monro, Hewfon, Cruikfhank, Shelden, Mafcagni, &c. have nearly completed our knowledge of the abforbent fyftem, and its ufes.

41 Difcovery of the abforbent fyftem.

In the latter end of the 17th century, fome important difcoveries were made on the fubject of refpiration, by our countryman Mayow; and thefe were fupported by the obfervations of Lower, Verheyen, and Borelli. Thefe difcoveries, however, lay dormant till they were brought into recollection a hundred years after in confequence of the experiments of Prieftley and Lavoifier.

During the 17th century, confiderable progrefs was made in completing the knowledge of the internal organs of generation. Much was done in this way by De Graaff and Malpighi, and Leuwenhoeck, the two latter of whom made feveral difcoveries with the affiftance of their microfcopes, though Leuwenhoeck founded on his obfervations a theory of generation which at this day appears not a little ridiculous.

42 Syftem of Boerhaave.

The beginning of the 18th century is remarkable for the promulgation of a new phyfiological doctrine, founded on a miftaken application of the circulation of the blood. We allude to the fyftem of Boerhaave. This great phyfician fuppofed that all the functions of the living body, excepting the will, are carried on by mechanical movements, fufceptible of rigid calculation, which neceffarily fucceed each other in the organs, from the time that life commences. Thefe movements are brought into action as foon as the animal begins to refpire, and are the confequence of an impulfive power in the heart, renewed by means of the influence of the nervous fluid brought from the brain. He conceived the living body to be merely a hydraulic machine, in which the heart performs the office of a pifton, and that the alternate contractions and dilatations that take place without intermiffion in that organ, are owing to the alternately increafed and diminifhed compreffion of the nerves that are diftributed to the heart. When a contraction takes place, the blood fills the large arteries, and thus diftends and compreffes them; when the principal nerves of the heart, which pafs between thefe arteries, muft of courfe become compreffed, and thus their influence being diminifhed, a relaxation takes place. But in proportion as the heart is relaxed, the large arteries become empty, and confequently ceafe to comprefs the nerves, which thus recovering their influence, reanimate the heart to a new contraction. Thus fucceed each other without interruption the movements which form the mechanical principle of all the fenfible motions that we obferve in the animal machine.

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Proceeding on these principles, Boerhaave conceived some very strange notions respecting the constituent properties of the living fluids, in which he saw no other mark of vitality than the globular form of their particles. He confined all the functions of the several organs to the operation of rounding into spheres the particles of the fluids which were presented to them, or of preserving that form in those which they already contained. He thought that the lungs were chiefly of advantage, because they contained within them a complete series of vessels, in which the particles of the blood can receive all those dimensions which may fit them to circulate through the rest of the body. The greater or less velocity with which the fluids circulate through the secretory organs, constitutes the principal difference in the nature of the secretions. Various orders of vessels receive the blood and other fluids which pass through these divisions, subject to the laws of hydraulics; and when a fluid got by chance into an order of vessels that was not fitted to receive it, some disease was the consequence. Every thing in the animal machine was reduced to an assemblage of conduits, canals, cords, levers, pulleys, and other mechanical contrivances, put into action by mechanical means.

43 Mechanists.

Thus was completed the system of mechanical physiology, which was begun some time before by Bellini and Borelli; and this system maintained its ground in defiance of observation and common sense, till about the middle of the 18th century. In the mean time, however, there arose two men, whose enlarged ideas and acute genius induced them to dissent from the received opinions of the day, and to think for themselves. These were Hoffman and Stahl, who, though they did not, any more than Boerhaave, form complete or unobjectionable theories, contributed much to improve our ideas of the animal economy.

44 System of Hoffman.

Hoffman saw, that in the living body we ought not to separate the principle of vitality from the general properties of matter. He believed that that principle, susceptible in itself of activity and motion, was sufficient for all the occasions and all the functions of the body which it animated. The animal body was not, in his eyes, an hydraulical elastic machine, formed of solids and canals, differing only in size, form, elasticity and force. He saw, that if the solids act upon the fluids, these must, in their turn, react upon the solids; and that life could subsist only by these mutual actions and reactions. The essential cause of life, according to Hoffman, is the progressive motion of the blood, occasioned by the impulse of the heart, and kept up by the alternate contractions and dilatations of the vessels. These contractions and dilatations are the consequence of the force of an elasticity inherent in the vascular fibres, and this force is still farther promoted by the different structure of these elastic fibres, which is such that they can be penetrated by the blood and the nervous fluid. This last fluid he imagined to be composed of aerial and etherial particles enveloped in a certain portion of a very pure subtile lymph, that served them as a vehicle. By this fluid the cavities of the nerves are filled, and it constitutes the sensitive soul, in which resides the seat of the passions. Now, all the functions, even those which we attribute to a sentient principle, are the effect of physical powers, whose mechanism has, however, something more sublime and more exalted with respect to the animal operations than to others. If all the nervous, vascular, and membranous parts, preserve a moderate degree of action, and a moderate state of tension and relaxation, the solids are subjected to oscillatory motions which balance each other, and produce a proper equilibrium in the system. In this state, all the operations of the body and the mind take place with proper regularity; and this happy harmony, by assuring to the animal the entire plenitude of its existence, becomes the foundation of health. This degree of moderate tension is always more or less altered in a state of disease.

45 Of Stahl.

Little satisfied with all the theories founded on a gross mechanism, and convinced of their insufficiency to explain the phenomena of vitality, Stahl admitted forces that were something more than mechanical, and that were directed by an intelligent principle which applies them to their destined uses, and which, by distributing them with a wise economy, proportions or accommodates them to the different occasions of the individual. His disciples consider Stahl as the first modern writer who has treated the science of man on a general plan, and according to a philosophical arrangement; and as his doctrine has still numerous advocates in the medical schools of France, we shall be somewhat more particular on it than on that of Hoffman.

In determining the limits between medicine and the other physical sciences, Stahl commences with separating from the former all those principles which, though true in themselves, have no relation to the nature of that science, which he considers as originating in observation alone. The knowledge of the physical state of the animal body cannot, he thinks, throw any light, either on the injuries to which it is exposed, or on the means of preventing or removing them. Consequently it is of little use in medicine, and has no right to govern an art, the object of which is, to remedy those injuries that threaten the human body. He proves that living bodies are freed from the necessary laws of mechanics, because all their actions tend to one common end;—an end which embraces the whole chain of the movements essential to life, and the means established for its preservation. The human body, by means of this mixture of mechanical and vital powers, tends naturally to self-destruction; but, on the other hand, the organic structure to which is attached the exercise of the actions peculiar to the human species, is founded on this mixture. It is therefore necessary that the body should be in a state of resisting this tendency, in order that it may be sustained; and as the corruptibility inherent in its nature, pursues it through every period of its existence, the opposing action necessary to prevent the corruption from taking place, must also be exercised without intermission. It is this preserving action that constitutes the essence of life.

The preservation of the body is indeed effected by a sort of mechanical action; it requires the corporeal organs as its instruments, and it depends on different coexistent and successive actions. Health is the result of that just conformation of the organs which enables them to perform their functions with ease.

The exact conformity which subsists between the structure of each organ, and the functions it is destined to perform, demonstrates to the philosophical eye an intelligent and wise principle, that in the formation of organized bodies directs and prescribes every thing in the

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The formation, the ſtructure, duration and movements of the body, do not belong peculiarly to it, as it is only a paſſive ſubject on which the ſoul impreſſes and realiſes the idea of the phenomena that ſhe has conceived. Every thing is derived from the union of the body with the active foreſeeing principle, which governs, according to ſpecial laws, thoſe phenomena which are more particularly vital, and which are moſt independent of the will. The immediate action of this latter faculty does not require the aſſiſtance of any other ſubſtance. The intervention of an intermediate principle would be there ſuperfluous; and Stahl rejects that of the animal ſpirits, which had been introduced to explain the mechaniſm of vitality, and which, by overcharging the ſcience, embarraſſes it with a uſeleſs hypotheſis.

Two faculties are ſufficient for the ſoul to act upon the body, and to preſerve it in a living ſtate, viz. thoſe of ſenſe and motion. By the former the animal learns to know the properties of the objects by which he is ſurrounded, or in which he is intereſted, and to eſtimate the relations that ſubſiſt between theſe objects and himſelf; the latter produces the motion of the whole machine, and determines all the changes of ſituation which it has to undergo in its whole, and in its parts.

The faculty of ſenſation has two modifications, relative to the two kinds of knowledge which the ſoul may receive by means of that function. The firſt of theſe reſides in the organs of ſenſe, and is adapted to external objects; the ſecond eſtabliſhes its ſeat in the interior organs, and refers to objects that are within, or ideas. Sometimes the moving power enveloped in the muſcular ſyſtem is diſplayed by the ſenſible actions that regulate the poſition of the body with reſpect to the objects of the univerſe, of which it makes a part; ſometimes concentrated within theſe organs, it excites inteſtinal motions, which maintain among their conſtituent parts, thoſe relations, and that equilibrium, which are neceſſary to preſerve the healthy ſtate, conſiſtence, and tone of each organ. The muſcular apparatus is ſubſervient to the exerciſe of the ſenſes; and the different motions which it impreſſes on the body, for the purpoſe of tranſporting it towards, or to a diſtance from, certain objects, are always determined by the convenience or inconvenience which the body, by means of the ſenſes, experiences from thoſe objects. The tonic motion, determined by the confuſed ideas of the principle of life, is diſplayed in the moſt hidden organic parts, in the moſt perfect repoſe and profound ſilence of the voluntary movements.

The ſoul gives to its organs the diſpoſition that is favourable to the ſenſations it wiſhes to receive, by virtue of the judgment that it exerts reſpecting theſe ſenſations, before it has experienced them. This judgment is exerted on the relations between the objects that excite theſe impreſſions, and the actual ſtate of the body; and it is the intuitive knowledge of theſe relations that determines, in all their infinitely diverſified ſhades, the pleaſure or the pain which the animal experiences from the objects that ſurround it.

Stahl regards the excretions as the means employed by nature to counteract the natural tendency of the body towards putrefaction. He believes that the animal humours are exceedingly diſpoſed to thicken, and that the circulation of the blood is the means made uſe of by nature to keep up their original fluidity. One of the cauſes that moſt favour the tendency of the humours to putrefaction, is *plethora*, to which nature oppoſes, ſometimes the motion of the ſolids that diſtribute the blood; ſometimes the hemorrhagic fluxes which unload the vaſcular ſyſtem. Theſe latter opinions are the principal foundations of what has been called the *humoral pathology*, which prevailed ſo long in moſt of our medical ſchools, and which, with certain modifications, is ſtill maintained in many parts of the continent.

46 Of Haller.

The favourable impulſe given to phyſical ſcience in general, by the philoſophical writings of Bacon and Newton, extended itſelf at length to phyſiology; and phyſiological writers became convinced that it was better to collect and arrange the facts that related to the economy of living beings, than to frame hypothetical ſyſtems concerning them. The honour of forming a rational digeſt of the phenomena of the animal economy was reſerved for Haller, who perceived the importance of aſſembling under one view, the experiments, facts, and obſervations of preceding writers, and of ſubſtituting them in the place of hypothetical reaſonings. He traced the plan of the immenſe edifice that he deſigned to conſtruct in his *Firſt Lines of Phyſiology*, and executed it on a grand and extenſive ſcale, in his *Elements*, in which he has brought together into a body of doctrine, as complete as could be expected in his time, all the materials of the ſcience. He perceived the inconvenience of a too ſtrict application of the laws of mechanical philoſophy to the living ſyſtem. He admitted an active force, which he conſidered as peculiar to the animal body, viz. irritability, which contains the reaſon or the experimental cauſe of muſcular motion. He maintained that irritability ſhould never be confounded with ſenſibility, and that the irritable fibre differs as much from the ſenſible fibre, as the function of motion from that of ſenſation. Laſtly, in his *Opera Minora*, he lays down many new and important points of doctrine reſpecting the ſtructure of our organs, and the mechaniſm of our functions; and he relates a number of experiments made on living animals, for the purpoſe of drawing from nature the ſecret of thoſe phenomena which ſhe appears moſt deſirous to conceal. We owe to Haller ſome curious reſearches reſpecting the formation of bone, and the production of callus, as well as ſome important elucidations of the manner in which the embryo contained in the egg is developed, and paſſes through the ſucceſſive ſtages of its organization. He has left us many experiments and details reſpecting the ſtructure of the heart, the circulation of the blood, and the pulſation of the arteries; on the mechaniſm of the ribs, and the action of the intercoſtal muſcles during reſpiration; on the differences between the ſenſible and irritable organs; on the action of the brain and nerves, &c.

The

History. The latter half of the 18th century is remarkable for many able phyſiologiſts, who will be admired by poſterity, either for the acuteneſs of their genius, or the important improvements that they have made in the ſcience. We may mention the names of Bordeu, La Caze, Bonnet, Vicq d'Azyr, Bichat, Dumas, and Cuvier in France; of Fontana and Spallanzani in Italy, and of Whytt, Cullen, Brown, and Darwin in Britain. We cannot pretend to enumerate all the opinions and diſcoveries of theſe celebrated men, but muſt content ourſelves with giving a ſketch of the three rival ſyſtems of Cullen, Brown, and Darwin, and a brief outline of the opinions of Bichat.

47 Of Cullen. The phyſiological ſyſtem of Cullen was founded chiefly on that of Hoffman. He placed the principle of the whole animal economy in the movement of the vital ſolids, regulated by the fundamental laws of the nervous ſyſtem. This notion of the vital ſolids, according to him, originates in the nerves, and being almoſt always united in the *ſenſorium*, is eaſily tranſmitted from one nervous part to another, as long as the medullary ſubſtance of the nerves continues in its natural ſtate of life and continuity. The contraction of the moving fibres connected with the ſenſible organs through the medium of the brain, is the direct effect of a movement that commences with thoſe objects. It is on the contractility inherent in the moving fibres, excited by their own extenſion, by the application of various ſtimuli, and often by the immediate influence of the animal or nervous powers, that all the phyſical actions of a living being depend. He regards this contractile force as diſtinct from all thoſe which are poſſeſſed by the ſimple ſolid, and the inorganic elaſtic parts of the body.

Of the theory of Brown, we have given a ſufficient detail under his life, and need not repeat it here.

48 Of Darwin. It is not eaſy to give a compendious view of the ſyſtem of Dr Darwin, that ſhall be intelligible to thoſe who have not examined his celebrated work, the Zoonomia; but we ſhall endeavour to give as brief and perſpicuous an account of it as poſſible. It is neceſſary firſt to notice the deſcriptions given of the terms to be employed, which are as follows.

The immediate organs of ſenſe are, by Dr Darwin, aſſerted to conſiſt, like the muſcles, of moving fibres. The contractions of the muſcles and of the organs of ſenſe, are comprehended under what are called *fibrous motions*, in contradiſtinction to the *ſenſorial motions*, or the changes which occaſionally take place in the *ſenſorium*. By this latter term is underſtood, not only the *medulla* of the brain and nerves, but alſo at the ſame time that living principle or *ſpirit of animation*, which reſides throughout the body, and which we perceive only in its effects. An idea is defined to be a motion of the fibres of ſome immediate organ of ſenſe; and hence is frequently termed alſo a *ſenſual motion*. Perception comprehends both the fibrous motion or idea, and the attention to it. When the pain or pleaſure ariſing from this motion and this attention produces other fibrous motion, it is termed *ſenſation*; thus limiting this term to an active ſenſe. Ideas, not immediately excited by external objects, but which recur without them, are termed either, 1. Ideas of *recollection*, as when we will to repeat the alphabet backwards; or 2. Ideas of *ſuggeſtion*, as when we repeat it forwards, A ſuggeſting B, B ſuggeſting C, &c. from habit.

After mentioning a number of experiments to prove the fibrous motions of the organs of ſenſe, Dr Darwin proceeds to lay down the following laws of animal cauſation.

1. The fibres which conſtitute the muſcles, and organs of ſenſe, poſſeſs a power of contraction. The circumſtances attending the exertion of this power of *contraction* conſtitute the laws of *animal* motion, as the circumſtances attending the exertion of the power of attraction conſtitute the laws of *inanimate* matter.

2. The *ſpirit of animation* is the *immediate* cauſe of the contraction of animal fibres. It reſides in the brain and nerves, and is liable to general or *partial* diminution or accumulation.

3. The ſtimulus of bodies external to the moving organ is the *remote* cauſe of the original contractions of animal fibres.

4. A certain quantity of ſtimulus produces *irritation*, which is an exertion of the ſpirit of animation exciting the fibres to contraction.

5. A certain quantity of contraction of animal fibres, if it be perceived at all, produces *pleaſure*; a greater or leſs quantity of contraction, if it be perceived at all, produces *pain*. Theſe conſtitute *ſenſation*.

6. A certain quantity of ſenſation produces *deſire* or *averſion*. Theſe conſtitute *volition*.

7. All animal motions which have occurred at the ſame time or in immediate ſucceſſion, become ſo connected, that when one of them is reproduced, others have a tendency to accompany or ſucceed it. When fibrous contractions ſucceed or accompany other fibrous contractions, the connection is termed *aſſociation*; when fibrous contractions ſucceed ſenſorial motions, the connection is termed *cauſation*; when fibrous and ſenſorial motions reciprocally introduce each other, it is termed *catenation of animal motions*. All theſe connections are ſaid to be produced by habit; that is, by frequent repetition. Theſe laws of animal cauſation are, according to our author, evinced by numerous facts, which occur in our daily exertions, and are employed by him to explain the diſeaſes and decay of the animal ſyſtem.

The four *ſenſorial powers*, upon which all the actions or motions depend, are thus characterized:

Irritation is an exertion or change of ſome extreme part of the ſenſorium, preſiding in the muſcles or organs of ſenſe, in conſequence of the appulſes of external bodies.

Senſation, is an exertion or change of the central parts of the ſenſorium, or the whole of it, beginning in ſome of thoſe extreme parts of it which reſide in the muſcles or organs of ſenſe.

Volition is an exertion or change of the central parts of the ſenſorium, or of the whole of it, terminating in ſome of thoſe extreme parts of it which reſide in the muſcles or organs of ſenſe.

Aſſociation is an exertion or change of ſome extreme part of the ſenſorium, reſiding in the muſcles or organs of ſenſe, in conſequence of ſome antecedent or attendant fibrous contractions.

To theſe four faculties correſpond ſo many claſſes of fibrous contractions, named *irritative*, *ſenſitive*, *voluntary*, and *aſſociate*. But all muſcular motions, and all ideas, are originally irritative, and become cauſable by ſenſation and volition from habit, i. e. becauſe *pleaſure* or *pain*, or *deſire* or *averſion*, have accompanied them; thoſe

 those ideas or muscular motions which have been frequently excited together, ever afterwards have a tendency to accompany each other.

Of these motions the *associate* seem most to have excited Dr Darwin's attention. He divides them into three kinds; *irritative associations*, as when any part of the extracted heart of a frog is irritated by puncture, the whole heart contracts regularly; *sensitive associations*, or the trains or tribes of motions established by pain or pleasure; and the *voluntary associations*, or those produced by volition.

The activity of this power of volition is supposed to form the great difference between man and the brute creation; the means of producing pleasure and avoiding pain given to man by this power being denied to brutes.

Corresponding to these four classes of motions, there are four classes of ideas; *irritative*, preceded by irritation; *sensitive*, preceded by the sensation of pleasure or pain; *voluntary*, preceded by voluntary exertion; and *associate*, preceded by other ideas or muscular motions.

It has been observed in Hudibras that

> " ——— A rhetorician's rules
> Serve nothing but to name his tools."

So we find that a considerable part of Darwin's works is taken up in establishing the new meaning which he attaches to terms well understood and long adopted.

We cannot enter more fully at present into the opinions of the Zoonomia, but we shall have occasion to notice some of them in the succeeding part of this article.

49 Opinions and arrangement of Bichat. Bichat's system, which has made so much noise on the continent, is chiefly founded on the division of life into two kinds, *organic* and *animal*; the former of which is common to all organized beings, while the latter, as its name imports, is peculiar to animals. Each of these two kinds of life may be considered as composed of two orders of functions, which succeed each other in an inverse order. The first of these series in *animal life* commences with external objects, and proceeds towards the brain; the second begins in the brain, and is thence propagated to the organs of motion and voice. In the first order of functions, the animal is passive; in the second he is active. External objects act on the body through the medium of the first; by the second, the body reacts on the external objects.

Two kinds of motion take place in *organic life*. In the first the formation of the body is constantly going on; in the second there is a constant decomposition: hence the elements of the body are continually changing, while the organization continues the same. Organic life is accommodated to the continual circulation of matter. The one order of functions assimilates to the nature of the animal, the nutritious particles received into the system; the other rejects what is useless, or is so much altered as to become noxious. The assimilating order of functions consists of digestion, circulation, respiration, and nutrition; all of which processes the matter received into the body must undergo, before it can become a part of the animal substance. When it has for some time constituted a part of the body, it is taken up by absorption, conveyed into the circulation, and thrown out thence, by cutaneous or pulmonary exhalation, or by some other emunctories. Hence, the second order of organic functions, or disassimilating functions, consist of absorption, circulation, exhalation, secretion, and excretion. The *brain* is the centre of *animal life*; the *heart* of *organic life*.

Bichat considers the proper balance of life to be preserved by the proportion which exists between the action of surrounding bodies, and the reaction of the system. This reaction is greatest in youth, hence the principle of life is at that time in excess. It is least in old age, and then the vital principle is defective. The measure of life is therefore the difference which exists between the efforts of external powers to overturn life, and the internal resistance to support it. The excess of the former shows the weakness of life; that of the latter indicates its strength.

The following table exhibits Bichat's distribution of the organs, or, as he calls them, *appareils*, belonging to *animal* and *organic life*, and to *generation*, which is common to both.

I. ORGANS OF ANIMAL LIFE.

ORGANS	1. *Locomotive*,	including	1. The bones and their dependances. 2. The muscles and their dependances.
	2. *Vocal*, including the larynx and its dependances.		
	3. *External sensitive*,	including	1. The eye. 2. The ear. 3. The nostrils. 4. The tongue. 5. The skin and its dependances.
	4. *Internal sensitive*,	including	1. The brain and its membranes. 2. The spinal marrow and its membranes.
	5. *Conducting sensation and motion*.	including	1. The cerebral nerves. 2. The nerves of the *ganglia*.

II. ORGANS

II. Organs of Organic Life.

Organs	1. *Digestive*,	including	1. The mouth. 2. The pharynx and *œsophagus*. 3. The stomach. 4. The small intestines. 5. The large intestines. 6. The *peritonæum* and *epiploon*.
	2. *Respiratory*,	including	1. The *trachea*. 2. The lungs and their membranes.
	3. *Circulatory*,	including	1. The heart and its membranes. 2. The arteries. 3. The veins of the general system. 4. The veins of the abdominal system.
	4. *Absorbent*,	including	1. The absorbent glands. 2. The absorbent vessels.
	5. *Secretory*,	including	1. The lachrymal ducts. 2. The salivary and pancreatic ducts. 3. The biliary and splenic ducts. 4. The urinary passages.

III. Organs of Generation.

Organs	1. *Male*.		
	2. *Female*.		
	3. *Produced by this union*,	including	1. The membranes and placenta. 2. The fœtus.

50 Recapitulation.

We have now taken such a view of the progressive state of physiological science, as we deemed consistent with the nature and extent of this article. It has taught us that the prevailing spirit of every age has had a marked influence on the productions both of art and science that have appeared during that period; and that physiology has always been impressed with the character of the science that was most prevalent at any particular period. While the doctrines of Aristotle prevailed in the schools, physiology never extended beyond the bounds that had been set to it by Galen; and the belief in occult qualities universally prevailed. When a taste for metaphysical speculations began to gain ground, this science was given over to the most abstract subtilities and absurd fictions. When Des Cartes had reformed the principles of the ancient philosophy, the study of the animal economy, like all the other branches of physics, was fettered by the trammels of the Cartesian doctrines. After the genius of philosophers was directed to chemistry, physiology also took a chemical turn, which it quitted only to take a new direction pointed out to it by the taste for mathematics and mechanical philosophy, which prevailed among all the literary at the end of the 17th and beginning of the 18th century; and now that the study of chemistry is become so general, we see that physiologists are for reducing the functions of the animal economy to the analytical and synthetical operations of the laboratory, and converting the living body into a furnace where a constant combustion is going on while life remains.

We are now to enter on the phenomena of life, and the functions of organized beings; and here we must premise, that in our illustration of these phenomena and functions we shall occasionally refer to every class of living creatures; it being our object rather to give a comparative view of physiology in general, than to confine our remarks to the human economy in particular. Indeed much of the physiology of man has already been given under Anatomy and Medicine; and of that of the inferior animals, we have treated of the physiology of the order *Cete* under Cetology; of that of *Reptiles* under Erpetology; of that of *Fishes* under Ichthyology; of that of *Serpents* under Ophiology.

Chap. I. *Of the General Phenomena of Life.*

When we take a general view of the objects of nature, we see that they differ from each other in many important particulars, and we soon find that they may be conveniently divided into two great classes; one capable of growth, nourishment, and reproduction; the other not susceptible of these changes. We perceive that all those substances which are found in the bowels of the earth, and many of those which appear upon its surface, continue for an indefinite time in the same circumstances, until they are acted on by each other, when they undergo certain changes which entirely alter their nature and former properties. 51 General idea of life.

Sulphur, in its natural state, is a solid substance insoluble in water, and possessing little activity when applied to the human skin; but if it be subjected to the action of heat, in contact with atmospheric air, or any other gas containing oxygen, it becomes a fluid, very miscible with water, and of a most corrosive quality, namely sulphuric acid. The hydrogenous gas found in the upper part of mines, would remain for ever uncombined with the oxygenous gas which forms part of the atmosphere in which it floats, were it not subjected to the action of caloric, or electricity in a very concentrated

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ed ftate; but as foon as either of thefe agents comes in contact with the mechanical mixture of gafes, a combination takes place, attended with a tremendous explofion, and the hydrogenous gas difappears.

52 Diftinction between organized and inorganic matter.

We find that all the bodies to which we give the name of minerals, poffefs no power in themfelves which can enable them to refift the operation of external agents; each individual of them is compofed of a fmall number of principles, and their texture appears to be made up of independent particles. Every other body in nature, comprehending the almoft infinite variety of plants and animals, though under certain circumftances fubject to the fame changes which take place among minerals, have, when thefe circumftances do not exift, an innate property by which they are enabled to refift the production of thefe changes. They do indeed undergo certain alterations, but by thefe their original habit and effential properties are not changed. From the time that a plant fprings from the feed, till it ceafes to vegetate, it is perpetually receiving an acceffion of new matter, and giving out a part of its former compofition: but the new matter is affimilated to it, and becomes a part of the plant; the identity of the plant is preferved, though its component parts are perpetually changing. The fame in a ftill higher degree takes place in animals. The individuals of this latter clafs, comprehending plants and animals, poffefs peculiar ftructure, very different from that of the former. Their texture is fibrous, and the fibres arranged and interwoven, fo as to form parts called organs, by means of which they carry on certain operations or *functions* neceffary for their prefervation, or for the reproduction of the fpecies. Hence thefe have been called *organized* bodies, while the others have been denominated *brute* or *inorganic* matter. See *NATURAL Hiftory*, N° 7.

The component principles of organized beings are much more numerous in each individual than thofe of inorganic matter, though their abfolute number in the former clafs is fmaller than in the latter. In order to prefent, under a compendious point of view, the diftinguifhing characteriftics of thefe two claffes of beings, we fhall give the following table.

The phenomena of inorganic matter are,	Mobility, Repofe, Aggregation, Cohefion, Gravitation, Condenfation, Dilatation, Combination, Diffolution.	Refolvable into	Inertia, Impulfion, Attraction, Affinity.
The phenomena of organized matter, befides thofe of inorganic matter are,	Impreffion, Senfation, Perception, Affection, Sympathy, Action, Locomotion, Digeftion, Circulation, Refpiration, Affimilation, Accretion, Reproduction.	Refolvable into four general forces,	Senfitive, Motive, Affimilative, and Vital refiftance.

The properties of inorganic matter are,	Extenfion, Gravity, Hardnefs, Elafticity, Fluidity, Impenetrability, Divifibility, Expanfibility, Permeability, Figurability.	The variations or degrees of which diftinguifh	Cryftals, Salts, Metals, Stones, Foffils.
The properties of organized matter, befides thofe of inorganic matter, are,	Regularity, Individuality, Spontaneity, Senfibility, Contractility, Irritability, Expanfibility, Corruptibility.	The variations or degrees of which diftinguifh	Man, Mammalia, Birds, Reptiles, Serpents, Fifhes, Mollufca, Cruftacea, Infects, Worms, Zoophytes, Plants.

53 Effects of life.

The differences that are found to prevail between organized beings and inorganic matter, have always been attributed to fomething of a fuperior nature, called vitality or life. This term life forms one of thofe fimple ideas which it is difficult to define, and as all underftand the meaning of the expreffion, a definition is the lefs neceffary; but if it be required, it cannot be expreffed more accurately than in the language of Bichat, who calls life *the fum of thofe functions which refift death*. In fhort, life is beft defcribed by the effects produced on a body while it refides in it, contrafted with thefe appearances which take place in the fame body when life is no longer prefent.

54 Refiftance to chemical change.

One of the moft general effects of the prefence of life is, as we have faid, the refiftance which living beings are by it enabled to oppofe to the operation of external agents; and this is moft remarkably feen with refpect to temperature. Every living being poffeffes, in a greater or lefs degree, the power of preferving nearly an uniform temperature, which is always a few degrees greater than that of the medium in which it lives. In plants, this power feems to exift but in a low degree. Some of the lower animals which inhabit the air, particularly infects, poffefs it much more completely. The great heat generated in a hive of bees is a familiar illuftration of this. In birds this property is very remarkable, the heat of their bodies being greater than that of any other fpecies of animals. The heat of fifhes, worms, and of moft reptiles, very little exceeds the temperature of the medium in which they refide; but when the water in which fifhes live is frozen, they are capable of refifting, for a long time, the confequences of the diminifhed temperature. The power which many animals poffefs of refifting high degrees of heat without any confiderable increafe of their own temperature, feems ftill more remarkable, and probably led to the fable of the falamander, which was fuppofed able to endure the heat of fire, and even extinguifh it, when thrown in for that purpofe.

55 Degrees of vitality.

Life feems to pervade almoft every part of a living being. In animals, every part, except the cuticle, hair, and nails, exhibits marks of vitality; but it feems to be dif-

tributed

General Phenomena of Life. tributed through those parts in a different manner in the various tribes of organized beings. In plants, and in a few of the inferior animals, as the zoophyta, it seems to exist independently in almost every part. A bud, slip, or sucker, torn from the parent plant, and inserted within the bark of another plant, or placed within the earth, in favourable circumstances, vegetates, increases, and in due time becomes a perfect plant, in all respects similar to the parent stock. If a polypus be cut in pieces, each piece lives and grows, till it becomes itself a complete polypus. If a worm be cut in two, so as to leave one part with the head, and the other with the tail, each part becomes a perfect worm, possessing both head and tail. As we ascend, however, in the scale of beings, we find life less equally and independently diffused. A part cut or torn from the body of most animals quickly loses its vitality; but this is lost sooner in some animals than in others. The head of a turtle or a snake is able to bite many hours or even days, after it is severed from the body; and in the former instance, the animal seems for a long time to experience little inconvenience from its loss. The heart of a frog is seen to move many hours after it is cut out.

56 Functions of living beings. The principal effects of the presence of life appear in the exercise of those functions or actions by which living beings preserve their existence, or reproduce their like.

57 Motion. One of the most general properties of organized beings is that susceptibility to motion, which is called irritability, which appears essential to life, and is possessed, in a greater or less degree, by every class of organized beings. The motions of plants are sometimes very remarkable, and approach very nearly to those which take place in animals. The stamina of the *cistus helianthemum* are seen to move in various directions when the sun shines on them; the leaves of the *mimosa pudica* (sensitive plant), when touched by the hand, or when irritated by the alighting of an insect on them, immediately contract; the *dionæa muscipula* (Venus's fly-trap), when a fly touches its leaves, closes the thorny fringes with which they are beset, on the presumptuous insect, and crushes it to death; but the motions of the *hedysarum gyrans* are the most remarkable of all those that take place in plants. The leaves of this extraordinary vegetable are seen in constant motion through the greatest part of the day, without the intervention of any apparent external impulse; and even when a branch is cut off and kept in water, the motion of the leaves continues for many hours together. All the plants which grow above the earth, expose their leaves and flowers to the warm sunshine, and when situated in a place which is supplied by light only from one quarter, they gradually direct their branches towards that part by which the light enters. In stormy weather they retract their leaves, and fold up their flowers, and when confined in the dark, their branches retain the position which they had when last exposed to the light.

The motions of many of the lower animals, though sufficiently apparent, are more obscure than those of plants. A muscle or an oyster seems to possess little more motion than is necessary to open and close the valves of its shell, and, no more than plants, has the faculty of conveying itself from place to place. This faculty of locomotion, which in all the higher classes of animals is dependent on the will, will be fully considered in the second chapter.

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The function which appears to be most universally diffused in living beings, is digestion, (including nutrition) or that by which the substances intended for their nourishment are assimilated to the nature of the body which they enter. This function varies considerably in the different classes. Plants merely attract water from the earth in which they grow, by means of the fibrous parts of their roots, whence it is conveyed by innumerable capillary vessels throughout the whole plant, in which it appears partly to be decomposed, and partly to remain in the state of water, diluting some of the vegetable principles, and thus forming the juices of the plant. In some of the inferior animals, digestion seems to be almost the only function which they are capable of performing. Thus, many of the zoophytes, as the polypi, appear to be almost entirely composed of a stomach, resembling the finger of a glove, into which the aliment is received, the nutritive part extracted, and the excrementitious part thrown out by the same opening. In most other animals, the alimentary canal has two distinct openings, one for the reception of the food, and the other for the ejection of the excrement. 58 Digestion.

By some animals the food is swallowed entire, and digestion is performed by a simple solution or trituration in the stomach; while in others the mouth is furnished with teeth, or other hard parts, capable of reducing the aliment to a pulpy state, in order to render its further digestion more easy and expeditious. In most animals, the food having undergone some change in the digestive organs, is taken up from them by certain very minute vessels, and carried to every part of the body; but in some it appears rather to exude through pores in the sides of the alimentary canal.

The function of circulation, by which the fluids are constantly moved through every part of the body, is not so general as either of the former functions. In plants there is no proper circulation; for although there are numerous vessels by which water enters into the substance of the plant, and in which the peculiar juices of the vegetable move, the motions of these fluids are not uniform, and do not tend towards one centre. The same defective circulation appears in many of the inferior animals, as in zoophytes and insects. As we rise, however, to the higher classes, we find a perfect circulation. In these there is always a peculiar organ from which the fluids are conveyed to the rest of the body, and to which they again return in a perpetual round. In some animals this central organ is single, while in others it consists of two similar organs joined together, from one of which the whole of the fluids proceed through one particular organ in a lesser circulation, and thence return to the other part, before they are distributed to the general system. 59 Circulation.

All organized beings require more or less the presence of atmospheric air for their subsistence, or at least for the due performance of the vital functions. In some, the agency of this fluid is conveyed merely by pores upon the surface; as in plants, in which the leaves absorb the air; and in several of the inferior animals, as insects and worms, over the surface of whose bodies are distributed numerous openings, by which the air enters. In animals of the higher orders there are peculiar organs called 60 Respiration.

called lungs or gills, through which air, or water containing air, enters, and from which its beneficial influence is imparted to the fluids which are circulating through them. In general, theſe beings exiſt for a very ſhort time, when deprived of atmoſpheric air, or when the element in which they live is deprived of oxygen: but in ſome of the lower claſſes of animals the abſence of oxygen is much leſs injurious; and there are inſtances of reptiles in particular having been preſerved in a ſtate ſuſceptible of life and motion, while buried for many years in the heart of a tree, or in the middle of a block of ſtone. Reſpiration, then, though in general neceſſary to the continuance of vitality, may, in many tribes of organized beings, be ſuſpended for a conſiderable time, without the principle of life being entirely de-

61 ſtroyed.

Reproduction. A function equally general, and equally indiſpenſible with that of digeſtion, and one which forms another characteriſtic of living beings, is the function of regeneration, a function more peculiarly neceſſary, as all organized beings, though capable of reſiſting for a conſiderable time the operation of external agents, tend ultimately to corruption and decay; and as they cannot, like inorganic matter, be regenerated by a reunion of their component principles, it was neceſſary that they ſhould poſſeſs the capacity of producing, while in exiſtence, a creature ſimilar to themſelves, to ſupply their place in the ſcale of being.

It has been a very general opinion among naturaliſts, that all living beings, both plants and animals, originate from ſeeds or eggs produced by the parent. This, although very generally true, is not a univerſal fact. Moſt plants, indeed, with which we are acquainted, appear capable, in their natural ſtate, of producing ſeeds, which form the embryo of a future plant. But in a great many of them new plants are obtained from buds, ſlips, or ſuckers, furniſhed by the parent. In ſome animals too, as the polypi, reproduction may be effected by dividing the parent into ſeveral pieces; and even the natural generation of theſe animals is performed by protuberances which grow from the body of the parent, and ſeem to drop off ſpontaneouſly, when capable of an independent exiſtence.

There are two ſtriking differences in the manner by which living beings are generated. In ſome, two diſtinct ſets of organs are neceſſary, and by the mutual action of theſe generation is effected; while in others, as in the inſtances we have mentioned of the polypus, this act of copulation appears to be unneceſſary. Almoſt all plants poſſeſs diſtinct ſexual organs, and in moſt both male and female organs are ſituated in the ſame individual. In theſe plants the female ovum is impregnated by a very fine powder, which is contained in part of the male organs, and is applied to thoſe of the female. We are fully convinced of the neceſſity of the vegetable copulation, by obſerving that the females of thoſe plants which have the ſexual organs ſituated in diſtinct individuals are not capable of producing fruit, or at leaſt do not produce this in perfection, if they are excluded from the influence of the male; and that an artificial impregnation may be brought about by bringing the male and female organs in contact. Many animals are hermaphrodite; and among theſe the individuals of ſome ſpecies generate without the aſſiſtance of another individual of the ſame ſpecies. This appears to be the caſe with the bivalve ſhell-fiſh. Others again, as ſnails, and moſt of the molluſca, which crawl upon the earth, copulate reciprocally, or each individual performs the double office of male and female. In moſt animals, however, the ſexes are diſtinct, and probably a real hermaphrodite in the ſuperior claſſes never exiſted. Another ſtriking difference with reſpect to generation in animals is the more or leſs perfect ſtate in which they bring forth their young. A large proportion of animals, among which are the inſect tribe, fiſhes and birds, produce eggs, which are afterwards hatched by the heat of the parent, or by that of the ſun. Other claſſes again, as ſome of the amphibia, and the whole of the mammalia, carry their young for a certain time within an organ deſtined for that purpoſe, from which they are excluded in the ſtate of perfect animals. 62

The laſt function which we ſhall here notice, is ſen- Senſation.
ſation. This appears to be leſs general than any which we have hitherto mentioned. It has indeed been ſuppoſed by many philoſophers and naturaliſts, that plants poſſeſs a degree of ſenſibility; and this opinion has been lately avowed and ſtrenuouſly ſupported by the elegant, but enthuſiaſtic author of the Botanic Garden, and the Loves of the Plants. That plants poſſeſs a ſuſceptibility of receiving impreſſions, and in conſequence of that of being rouſed into action by external ſtimuli, we ſhall readily admit, and ſhall hereafter aſſign to this ſuſceptibility its due importance; but as there is no reaſon to believe that it ever produces ſenſation, we muſt not confound it with the ſenſibility of animals; nor is the difficulty of explaining ſome of the functions of vegetables, without reſorting to the hypotheſis of a vegetable ſenſorium, a ſufficient reaſon for inveſting them with this faculty. It has even been doubted whether ſome of the inferior animals, as the zoophytes, poſſeſs this function, as nervous fibres have not yet been detected in their organization. It is probable, that there is a regular gradation in the tribes of organized beings with reſpect to ſenſation, as well as the other functions; and though we have not been able to diſcover all the links of this chain, theſe will probably, as our knowledge of nature increaſes, come more into view, and we ſhall then be able to reconcile many circumſtances which we cannot at preſent comprehend.

With reſpect to the varieties that take place in the number and degree of the external ſenſes, as poſſeſſed by the various claſſes of animals, we may refer the reader to what has been ſaid on that ſubject in the firſt chapter of the comparative part of the article ANATOMY. 63

The duration of life is exceedingly various. We Duration of
know that there are animals which live but a few hours, life.
as the inſects called *ephemeræ*; and that others, as the *elephant*, the *raven*, and the *pike*, may exiſt for a century. The term of life allotted to plants is alſo various; ſome live only for a year, and are hence called *annual* plants; others exiſt for two years, and are called *biennial* plants; while a few ſurpaſs in longevity any thing with which we are acquainted in animated nature. Thus, the *oak* is ſaid to require 100 years, in order to acquire its full maturity; to retain its perfect vigour for the like term, and to complete at leaſt a third century before it entirely decays. The *cheſnut* is a ſtill more remarkable inſtance of vegetable longevity. The account of the gigantic cheſnut on Mount Ætna, given by

by Brydone and other travellers, which has exiſted for many centuries, muſt be familiar to moſt of our readers. We have hitherto conſidered life as diſplayed in the exerciſe of functions; but it may exiſt independently of this exerciſe, or it may lie dormant for a conſiderable time, till called into action by particular circumſtances. Every one knows how long a ſeed or an egg, when excluded from heat, air, and moiſture, will retain the faculty of producing a plant or an animal. The only proof we have, that this faculty ſtill exiſts, is, that when we place the ſeed or the egg in circumſtances favourable to the developement of the embryo which it contains, the proceſs of generation goes on, till the plant or the animal is excluded. We know alſo, that after an organized being has commenced the exerciſe of its functions, this exerciſe may ceaſe for a time, or at leaſt become almoſt imperceptible, while yet the vital power ſhall remain ſuſceptible of reviving its activity at a future period. We then ſay, that the animal or vegetable is in a torpid ſtate. On this part of the hiſtory of life we ſhall not enter at preſent, but ſhall defer the conſideration of it till we come to treat of ſleep and death.'

The above is a haſty comparative ſketch of the functions exerciſed by the various tribes of organized beings. It is ſufficient to ſhow, that there is in theſe beings a vital power which completely diſtinguiſhes them from brute or inorganic matter.

64 Cauſe of life.

A queſtion which naturally ariſes in every thinking mind is, What is the eſſence of life, or on what does it depend? Though we profeſs ourſelves unable to anſwer this queſtion in a ſatisfactory manner, and believe that all who have hitherto attempted to do ſo, have failed in their attempts, it may be acceptable to moſt of our readers to know the opinions of the moſt reſpectable writers on this abſtruſe ſubject. Theſe, therefore, we ſhall briefly ſtate.

65 Opinions reſpecting the vital principle.

Theſe opinions have chiefly reſted on the queſtion, whether life be an independent, immaterial principle, or merely a phyſical or chemical modification of matter. We have already, in the hiſtorical view which we have given of the progreſs of phyſiology, mentioned ſome of the more remarkable doctrines reſpecting the principle of life that have been delivered prior to the 18th century; we ſhall here, therefore, only mention thoſe which have been maintained ſince that time.

66 John Hunter.

Mr John Hunter, in his valuable treatiſe on the blood, ſuppoſes the principle of vitality to exiſt in that fluid, or that the blood has life; and has founded this doctrine chiefly on the following proofs. Firſt, It unites living parts, when it is effuſed between them. Secondly, It becomes vaſcular like other living parts; its temperature as it flows from the veſſel, is always equal in the moſt oppoſite temperature in which the body can bear expoſure. Thirdly, It is capable of being acted upon by a ſtimulus, as is the caſe when it coagulates. Fourth, Paralytic limbs, though deprived of motion and ſenſation, are yet nouriſhed and preſerved alive by the blood circulating through them.

Mr Hunter's idea of the vitality of the blood is merely the revival of one of the oldeſt phyſiological doctrines on record; namely, that delivered to the Iſraelites by Moſes, that in the blood is the life of an animal.

67 Goodwin.

Dr Goodwin, in his work on the connection of life with reſpiration, is of opinion, that the heart is the great ſeat of the principle of life in all the more perfect animals; and that the contractions of the heart with the ordinary ſtimulus is the only mark of the preſence of this principle; that when the heart contracts under ſuch circumſtances, the body is alive; when not, it is dead. Life he therefore defines to be the faculty of propelling the fluids through the circulatory ſyſtem. According to him, the external concomitant circumſtances which operate upon the body in health are heat and reſpiration, which excite the vital principle to action; and whenever the functions of an animal are ſuddenly ſuſpended, and the body puts on the appearance of death, it is always in our power to determine whether it be really dead, by reſtoring the temperature, and by inflating the lungs with proper air. He is of opinion, with ſome others, that there are no means of determining the abſolute deprivation of the vital principle but by the preſence of putrefaction.

It has lately become faſhionable to conſider life as the conſequence of certain chemical changes, which are going on in the body; an opinion which is chiefly ſupported by Hufeland, Girtanner, and Humboldt.

68 Hufeland.

According to Hufeland, life is a chemico-animal flame, to the production of which oxygen is abſolutely neceſſary, and the vital power is the moſt general and powerful of all the powers of nature. He conſiders it as the cauſe of organization, and as poſſeſſing the following properties.

1. It has a greater affinity to ſome organized bodies than to others; thus, the polypus may be cut in pieces without being diveſted of it, and a decapitated tortoiſe or a frog deprived of its heart will live a long time after; whilſt to the human body, or a quadruped, it would be inſtant death. According to this phyſiologiſt, it is a general rule, that the ſtronger the affinity between life and an organized being, the more imperfect is the animal; hence the zoophytes, whoſe whole organization conſiſts in a mouth, a ſtomach, and a gut, have a life exceedingly tenacious, and difficult to be deſtroyed. 2. It is in greater quantity in ſome organized bodies than in others. In general, cold-blooded animals live longer than thoſe with warm blood. 3. It frees bodies from the chemical laws of inanimate matter, and transfers the component parts of a body from the phyſical or chemical to the organic or living world. 4. It prevents putrefaction, for no organized body can putrefy unleſs deprived of life.

69 Humboldt.

Humboldt is of opinion, that the degree of vitality depends upon the reciprocal balance of the chemical affinities of all the elementary parts of which the animal body is compoſed.

70 Cuvier.

Some phyſiologiſts of the preſent day deny the exiſtence of the vital principle altogether. "The idea of life (ſays Cuvier), is one of thoſe general and obſcure ideas produced in us by obſerving a certain ſeries of phenomena, poſſeſſing mutual relations, and ſucceeding each other in a conſtant order. We know not indeed the nature of the link that unites theſe phenomena, but we are ſenſible that a connection muſt exiſt; and this conviction is ſufficient to induce us to give it a name, which the vulgar are apt to regard as the ſign of a particular principle, though in fact that name can only indicate the totality of the phenomena which have occaſioned its formation."

71 Ferriar.

Dr Ferriar, in his obſervations concerning the vital principle, thinks, that ſome direct arguments may be brought

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brought againſt the general ſuppoſition of an independent living principle. Theſe arguments he divides into two kinds, viz. refutations of the general proofs offered in ſupport of the vital principle; and inſtances of the direct influence of the mind and brain over what is termed the independent living principle. The great proofs for the ſupport of a vital principle, are the contraction of muſcles ſeparated from the body on the application of ſtimulants; the performance of the vital and involuntary motions without any exertion or even conſciouſneſs of the mind, and the birth of full-grown fœtuſes deſtitute of a brain. In all theſe caſes, ſomething is alleged to operate, independently of the mind, in producing muſcular motion.

Dr Ferriar, in anſwer to the firſt argument drawn from the contraction of ſeparated muſcles, affirms, it may be ſaid, 1ſt, That the power of contraction, in a ſeparate muſcle, is loſt before putrefaction takes place, i. e. before the deſtruction of its texture; but if its vitality depended on its texture, this ought not to happen. 2dly, The power of contraction, in a ſeparated muſcle, is ſtrongeſt upon its firſt ſeparation, and becomes weaker by degrees; therefore, the contracting power ſeems to have been derived from ſome ſource from which it is detached by the exciſion of the part. 3dly, Irritation of the *medulla oblongata*, or of the nerves ſupplying particular muſcles, occaſions ſtronger contractions than irritation of the muſcles themſelves; and Dr Whytt furniſhes an experiment on a frog, directly proving, that the action of ſeparated muſcles depends upon the nervous energy. 4thly, Dr Haller himſelf is obliged to make on this ſubject a conceſſion ſufficient to deſtroy his favourite hypotheſis of the *vis inſita*. 5thly, When a paralytic limb is convulſed by the electric ſhock, the motion never takes place without the patient's conſciouſneſs. In this caſe there is no diſtinction between the vital principle, and that exertion which in voluntary motion is always attributed to the mind. See Chap. iii.

In anſwer to the ſecond argument, in favour of a vital principle, drawn from the performances of the vital and other involuntary motions, Dr Ferriar contents himſelf with only obſerving, that, allowing the organs of thoſe motions to be ſupplied with nervous energy, their motions may be very well accounted for by the ſtimulus of their contained fluids.

The force of the third argument, drawn from the want of a brain in full-grown fœtuſes, is taken off by Dr Whytt, who remarks, that as the heart is ſometimes wanting in full-grown fœtuſes, the argument would equally prove, that the heart is not neceſſary for the continuance of circulation, as that the brain is not neceſſary to the ſupport of the ſyſtem. Accordingly, fœtuſes born without a brain do not, in general, ſurvive birth.

Beſides the general ſuppoſition of an independent living principle, an inference has been drawn from facts, of a nervous energy independent of the brain. By this term is meant, that condition derived from the brain to different parts of the body, by means of which they become capable of motion. To ſhow, by direct proof, that there is no independent vital principle, Dr Ferriar obſerves, 1. That it is juſtly urged by Dr Monro againſt the doctrine of the *vis inſita*, that there is too much deſign in the actions of different muſcles, affected by different *ſtimuli*, to be the effect of mere mechaniſm. Thus, when the hand or foot is burnt, or otherwiſe ſuddenly injured, the muſcles on the part immediately ſtimulated are not thrown into action, nor the muſcles on the ſide irritated, but their antagoniſts contract immediately and ſtrongly. Now, if the inſtantaneous action be in this caſe chiefly produced by an effort of the mind, the ſuppoſition of a diſtinct vital principle is ſuperfluous: if it be ſaid to be produced by a living power independent of the mind, then there muſt be a rational power in the body independent of the mind, which is abſurd. 2. The ſtate of the vital and involuntary motions is conſiderably affected by the ſtate of the mind, which equally diſproves the exiſtence of a ſeparate vital principle, and proves the dependence of the nervous energy upon the brain. 3. Madneſs, it is well known, is frequently produced by cauſes purely mental, and in perſons apparently in good health; and, as the patient's ſenſibility to very powerful ſtimuli is much diminiſhed in maniacal caſes, they afford another proof of the ſubordination of the nervous energy. 4. It has been obſerved, that in paralytic caſes, motion is frequently deſtroyed, while ſenſe remains. As the cauſe of palſy almoſt always reſides in the brain, this fact appears equally inexplicable on the opinion of a diſtinct living principle, or of a nervous energy, independent of the brain. 5. When nerves are regenerated, after being cut through, ſenſation and voluntary motion are not always reſtored to the parts beneath the diviſion: the reſtoration was never made in Dr Monro's experiments. But, on the ſuppoſition of a diſtinct nervous power, the nerve, after its re-union ought to reſume all its offices. 6. Dr Whytt aſſerts, that when the ſpinal marrow of a frog is deſtroyed, after decollation, no contraction can be excited in the limbs, by cutting or tearing the muſcles. Such are the facts and arguments which Dr Ferriar brings againſt the opinion of a diſtinct living principle; and he thinks, that their inveſtigation appears to lead us back to the brain as the ſource of ſenſibility and irritability.

72 Ruſh.

In the life of Dr John Brown, we have given an account of the doctrine, of life being a forced ſtate. This doctrine appears to have been firſt delivered by Dr Cullen, though he afterwards retracted it. Of late Dr Ruſh of Philadelphia, in his *Lectures on Animal Life*, has advanced many arguments in favour of this doctrine. He includes, in animal life, three properties as applied to the human body, viz. *motion*, *ſenſation*, and *thought*; and theſe, when united, compoſe perfect life. It may exiſt without thought or ſenſation; but neither ſenſation nor thought can exiſt without motion. He affirms, that the loweſt degree of life exiſts even in the abſence of motion. He firſt conſiders animal life as it appears in the waking and ſleeping ſtate, in a healthy adult; and afterwards inquires into the modification of its cauſes in the fœtal, infant, youthful and middle ſtates of life, in certain diſeaſes, in different ſtates of ſociety, and in different animals, and lays down the following propoſitions:

1. Every part of the human body, the nails and hair excepted, is endued with ſenſibility or excitability, or with both.

2. The whole body is ſo formed and connected, that impreſſions made in the healthy ſtate upon one part excite

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excite motion, or ſenſation, or both, in every other part of the body.

3. Life is the effect of certain ſtimuli acting upon the ſenſibility and excitability, which are extended in different degrees to every external and internal part of the body; and theſe ſtimuli are as neceſſary to its exiſtence as air is to flame.

He continues to obſerve, that the action of the brain, the diaſtole and ſyſtole of the heart, the pulſation of the arteries, the contraction of the muſcles, the periſtaltic motion of the bowels, the abſorbing power of the lymphatics, ſecretion, excretion, hearing, ſeeing, ſmelling, taſte, and the ſenſe of touch, even *thought* itſelf, are all the effects of ſtimuli acting upon the organs of ſenſe and motion.

Theſe have been divided into external and internal.

1. The external are light, ſound, colours, air, heat, exerciſe, and the pleaſures of the ſenſes.

2. The internal ſtimuli are food, drinks, chyle, blood, tenſion of the glands which contain ſecreted liquors, and the exerciſe of the faculties of the mind.

Life, therefore (according to the hypotheſis of Ruſh), even thought itſelf, is merely a quality reſiding in the component parts of a material ſyſtem, dependent upon a peculiar organization, by which it is enabled to act, or in ſome ways to move on being ſtimulated or excited. Hence life can never be inherent in a ſimple uncompounded ſubſtance, nor in a particle of animal matter; and if the ſtimulus be withheld from a living ſyſtem beyond a given time, all motion, ſenſation, and thought, muſt neceſſarily be extinguiſhed.

73 Vital principle ſuppoſed by ſome to be diviſible.

Inſtead of one vital principle, ſome phyſiologiſts have ſuppoſed the exiſtence of ſeveral in the ſame body; and from the phenomena that take place in ſome organized beings, as the reunion of parts that had been ſeparated, the reproduction of others that have been loſt, and the ſeparate exiſtence of the divided parts of ſome worms and zoophytes, it was formerly the opinion of a celebrated lecturer on anatomy, that the vital principle was really divided. From more conſiderate and extenſive inquiry, however, he is now of opinion, that the irritability on which theſe phenomena depend, is never the direct or immediate operation of the vital principle, but only the conſequence of its operation; and in no caſe excluſively the conſequence, but the conſequence likewiſe of other operations proceeding from a number of different cauſes; and hence it is that a vital principle may often exiſt where it cannot operate in a ſenſible manner, from the want of auxiliaries; and hence it is, likewiſe, that its effects may often be continued, at leaſt for a while after its departure.

With regard to the portions of plants and polypi that continue to live in a ſeparate ſtate, aſſume the form of their reſpective ſpecies, and propagate their kind, they will be found, on a cloſe examination, to have been originally complete ſyſtems; many of the plants and many of the polypi that were uſually conſidered as ſimple individuals, not conſtituting one animated ſyſtem, but rather a congeries of animated ſyſtems,—a congeries, too, which after all is nothing more than a ſpecies of ſociety, where animated beings are aſſociated together for mutual protection; ſuch as we ſee among men in a city; among bees in their cells, which, in point of form, are ſimilar to plants †.

† Barclay on Muſcular Motions, p. 265.

Of Senſation.

CHAP. II. *Of Senſation.*

74 Neceſſity of ſenſibility to organized beings.

As all living beings are ſo related to each other, and to the inanimate objects of nature, as to be capable of deriving benefit, or receiving injuries, from the one or from the other; it ſeems neceſſary that they ſhould poſſeſs the faculty of perceiving the proximity of the beneficial or injurious object, that they may avail themſelves of the benefit which it holds out, or avoid the danger which it threatens. Accordingly, we find that all organized beings enjoy in ſome degree the capacity of *receiving impreſſions*, which we think is proved by the motions which take place in them when affected by external agents. When a plant expands its flowers to the ſun, or turns, as it were, its back to the blaſt; when it ſtretches out the fibres of its roots to imbibe the diſtant moiſture, or directs its branches to the only chink by which it can receive the light of day; we think theſe motions are the conſequence of that capacity of *receiving impreſſions*, or of being rouſed to action by *ſtimuli*; we think that this may be conceded, without having recourſe to the influence of mind, or even the medium of a nervous ſyſtem; we do not believe that the graſs we cruſh beneath our feet is ſenſible of pain, nor do we ſuppoſe with the poet, that

> —— "E'en the poor beetle that we tread on
> In mortal ſufferance feels a pang as great
> As when a giant dies."——

75 Senſitivity.

but we are of opinion, that even in the loweſt tribes there is a degree of that faculty, which in the higher orders of animals we call *ſenſibility*, and which we ſhall here, after a lecturer on the animal economy in London, denominate *ſenſitivity*. This inferior degree of the ſenſitive faculty we ſhall ſuppoſe to be poſſeſſed by plants, zoophytes, and animalcules, or thoſe organized beings in which we can perceive no marks of a nervous ſyſtem; while we ſhall confine the term *ſenſibility* to all other claſſes of animals.

Theſe faculties we conſider as qualities of living *bodies*, while we regard ſenſation, like perception, as a quality of *mind*. We leave it to the metaphyſician to mark the line of diſtinction between ſenſibility and ſenſation, and to ſhow how the one ariſes from the other. See METAPHYSICS, Part I. chap. 1.

76 Nervous ſyſtem.

The organs of ſenſation conſiſt of the brain properly ſo called, the cerebellum, the medulla oblongata, the ſpinal marrow, the nerves, and ganglia; together forming what is called the *nervous ſyſtem*. Theſe parts in the human body have been deſcribed under ANATOMY. For an account of theſe organs in the inferior animals, we muſt refer to the lectures of Cuvier, vol. ii. or the Comparative Anatomy of Blumenbach.

In reſpect of *ſenſibility* the animal is only paſſive; but when *ſenſation* is produced, he becomes active, in as much as the organs of the external ſenſes are then brought into action. It is by means of theſe ſenſes that the animal receives intelligence from without. We ſhall therefore examine theſe before we mention the phenomena of ſenſation in general.

1. *Of Feeling.*

77 Feeling.

The moſt general of all the ſenſes, and the moſt widely

ly diffuſed over the body of an animal is that of touch or feeling. Animals that poſſeſs ſcarcely any other ſenſe ſeem always to have that of *touch*. It is doubtleſs by this that *polypi*, *actiniæ*, and other water animals, perceive the approach of their prey, or are warned of impending danger, from the agitation of the water that is communicated to their bodies. Indeed ſo general is this ſenſe, that ſome phyſiologiſts think we may reduce all others to it as a genus; and ſuppoſe that *ſmelling*, *taſting*, *hearing*, and *ſeeing*, are only ſpecies of *feeling*. This reference is not uncommon in ordinary ſpeech, as it is not unuſual to talk of *feeling* a *ſmell*.

78 Uſe. By *touch*, taken in its ordinary limited ſenſe, we perceive the more ſtriking external qualities of bodies, as *figure*, *hardneſs*, *ſoftneſs*, *roughneſs*, *ſmoothneſs*, *moiſture*, *dryneſs*, *heat*, *cold*; of all which, except figure, we could ſcarcely form any idea by the other ſenſes. There is probably no ſenſe that can ſo well ſupply the place of others as that of *touch*; and it is particularly acute in thoſe who have loſt their ſight or hearing. See the article BLIND, eſpecially the Appendix.

79 Organs. The organs of touch are the ſkin and its productions, or rather the nervous papillæ (ſee ANATOMY, N° 76.) that form ſo large a part of the true ſkin. As many animals, however, have the body ſo enveloped in a ſcaly, ſhelly, or hairy covering, as to prevent the actual contact of the body by external objects, there are other organs that ſeem deſtined to fulfil this office. In man, the points of the fingers and the lips are the moſt delicate feeling organs; in many quadrupeds too, the lips ſeem to poſſeſs an exquiſite ſenſibility, and in ſome, as the *rhinoceros*, the upper lip is lengthened out as if to ſerve the purpoſe of a hand. The prolonged ſnouts of the *tapir*, the *ſhrew*, the *mole*, and the *hog*, ſeem to anſwer the ſame purpoſe; and the exquiſite ſenſibility and flexibility of the trunk of the elephant is well known to fit that organ for almoſt all the purpoſes to which the human hand can be applied. The tail, in ſome ſpecies of *monkey*, *oppoſum* and *ant-eater*, and in ſome reptiles, ſeems to poſſeſs a high degree of ſenſibility. In ſome animals, as the *cat*, the whiſkers are employed as organs of *feeling*, as we know that theſe are erected when the animal is paſſing through a narrow hole. Several ſpecies of fiſhes have *cirri* and *tentacula*, which they ſeem to uſe as fingers in aſcertaining the approach of their prey; and in inſects, the *antennæ* and the *palpi* are evidently organs of feeling, as are the arms, the tufts, and tentacula of *ſea-ſtars*, *ſea-urchins*, *actiniæ*, *meduſæ*, and many zoophytes.

80 Nature of touch. Moſt of the actions of external bodies on the ſurface of the animal body, are merely mechanical, though the ſenſations which they communicate may often be the effects of a chemical change in ſome of the feeling organs, and this change can be produced only in conſequence of the power of ſimple preſſure, to form or deſtroy ſome of the combinations that take place in the animal ſyſtem. The ſenſations which appear moſt evidently to ariſe from a chemical change in the organs, are thoſe that give notice of a change of temperature. When a body that has a temperature below that of the animal, comes in contact with the ſurface of this latter, we know that it abſtracts from that ſurface a part of its caloric, as by the contact it gradually acquires the temperature of the animal; unleſs, indeed, it be ſo large and ſo cold as altogether to deſtroy life. As, however, the reſiſtance which the animal body gives to a too great change of temperature, generally confines this change to the ſurface of the body; there muſt be ſomething more than a mechanical or a chemical action, or the ſenſe of feeling muſt depend chiefly on the vital principle.

81 Univerſality of feeling. As the ſenſe of feeling, from its general diffuſion, may be conſidered as the moſt eſſential of all the ſenſes; its degrees of perfection have conſiderable influence on the nature of different animals.

Of all *vertebral* animals, man ſeems to poſſeſs this ſenſe in the moſt perfect degree; but among the *invertebral* animals, the touch ſeems to improve as the other ſenſes degenerate; and theſe animals which appear to have no other ſenſe, poſſeſs this in ſo exquiſite a degree that they ſeem to feel even the light.

Dr Darwin thinks it probable, that the animal body is furniſhed with a diſtinct ſet of nerves for the ſenſation of *heat* and *cold*. We do not ſee the neceſſity of this, as we think that this ſenſation is very naturally reducible to that of *feeling*.

82 Senſibility of the animal body. To this head naturally belongs the conſideration of what parts of the human body poſſeſs ſenſibility, and what are inſenſible. This diſcuſſion is curious, and ſome time ago exerciſed the ingenuity of two very able phyſiologiſts, Haller and Whytt; between whom it gave riſe to a long and warm diſpute. We cannot pretend to enter into the merits of this controverſy, for an account of which we refer our readers to Dr Whytt's *Phyſiological Eſſays*, and to the *Principes de Phyſiologie* of Dumas, tom. ii. part iii. ſect. 1. chap. 1.

The general reſult ſeems to be, that many parts will appear ſenſible or inſenſible, according to the nature of the ſtimuli applied to them, and that many of thoſe parts which in their natural and healthy ſtate appear inſuſceptible of pain, are when inflamed or otherwiſe altered by diſeaſes, highly ſenſible; and that the brain, which is conſidered as the centre of all ſenſation, and the puncture or laceration of which is attended with moſt diſtreſſing ſymptoms in other parts, is to ordinary ſtimuli as inſenſible as the cuticle or the nails. See alſo on this ſubject, Bichat "Anatomie Generale," tom. i. p. 161.—167.

The principal morbid affections of this ſenſe, are *pain*, *itching*, and *want of feeling*; for an account of which ſee MEDICINE, N° 77. The functions of the ſkin, independently of its uſe as an organ of touch, will be conſidered in two of our ſucceeding chapters.

2. *Of Taſting.*

83 Taſting. This ſenſe is the moſt nearly allied to feeling of any of the other ſenſes, and therefore very properly comes under our conſideration after that ſenſe.

84 Organs. The principal organ of taſte is the tongue, eſpecially at its upper ſurface, point, and edges; but it alſo extends to the lips, the palate, and the *velum pendulum palati*. The tongue is not abſolutely neceſſary to taſte, as appears from a caſe mentioned by Juſſieu, of a perſon who had only a fleſhy tubercle in place of a tongue, and yet poſſeſſed the ſenſe ſufficiently perfect.

85 Different organs variouſly affected. The ſeveral parts of the organs of taſte are not equally ſenſible to every ſapid body; the tongue ſeems to be more particularly affected by ſaline and ſaccharine ſubſtances, chiefly, however, at its upper ſurface; the lips are ſaid to be

Of Senſation.

be moſt ſuſceptible of the taſte of *hellebore*, the palate of *belladonna*, and the gullet of *wormwood*. The *momordica elaterium* is ſaid chiefly to affect the back of the tongue, and *colocynth* its middle.

86 On what the perfection of taſte depends. The greater or leſs perfection of this ſenſe depends much on the ſoftneſs, flexibility, and moiſtneſs of theſe parts. As man ſeems to poſſeſs theſe qualifications in a more eminent degree than moſt other animals, ſo, in the natural unſophiſticated ſtate of the tongue, he probably enjoys the benefit of taſte much more highly than they. Such is the caſe with all young children, and with the peaſant, whoſe ſimple fare appears to be eaten with a much greater reliſh than all the delicacies of the voluptuary, who muſt have recourſe to various ſtimuli to enable him to derive gratification from even the daintieſt viands (A).

Taſte ſeems to be more exquiſite when the ſapid body is ſtrongly preſſed between the tongue and the palate. Taſte is alſo rendered more acute when the tongue is ſtimulated by various condiments, as *pepper*, *muſtard*, which even, when not taken in ſuch quantity as to be very perceptible themſelves, evidently increaſe the reliſh of the diſhes which they ſeaſon. Much alſo depends on the nature and ſtate of the bodies that are applied to the organs of taſte. Theſe muſt, in the firſt place, be either fluid, or capable of ſolution in the ſaliva. They muſt alſo poſſeſs ſome ſaline or acrid quality, to render them capable of acting on the nervous *papillæ*. It was formerly ſuppoſed, that ſaline bodies alone poſſeſſed the power of affecting the organs of taſte; and it was conceived by Bellini, that the different flavours of ſaline bodies depended on the figure of their cryſtalline particles. M. Dumas has taken conſiderable pains, and has advanced ſeveral arguments, to ſhow the abſurdity of this hypotheſis; and we think has treated it with more ſerioutneſs than it deſerves. That the different ſenſations which ſapid bodies excite in our organs of taſte, depend chiefly on a difference in their chemical nature, muſt, we think, be allowed, and ſome have gone ſo far as to ſuppoſe, that the ſenſation depends on ſome chemical affinity between the ſapid body and the nervous fluid.

87 Modifications of taſte. The impreſſion which ſapid bodies make on the organs of taſte is modified by age, ſex, temperament, and habit. We know that children are particularly pleaſed with ſweet things, while high ſeaſoned diſhes and vinous liquors are more palatable to people of a more advanced age. Women, from various cauſes, eſpecially during pregnancy, and when labouring under hyſteric affections, have often very ſingular taſtes. People of a warm and a mobile conſtitution are often affected by flavours that are almoſt inſenſible to others; and cuſtom will render palatable many ſubſtances, which, when firſt taſted, are rejected with diſguſt.

88 Uſes of taſte. Beſides the gratification afforded to animals by the ſenſe of taſte, this is ſuppoſed to afford one of the principal means of diſtinguiſhing between wholeſome and deleterious ſubſtances. Indeed, with reſpect to the inferior animals, this diſcriminating ſenſe is ſeldom known to fail, and in this inſtance, they are ſuperior to man, who is often deceived. There are many poiſonous herbs, the fruits or roots of which have a taſte not unpleaſant, but which cannot be eaten with impunity.

On the morbid affections of taſte, ſee MEDICINE, N° 78.

3. *Of Smelling.*

The ſenſe of ſmelling, like that of taſte, is nearly allied to feeling, and is one of thoſe by which we become acquainted with the mechanical and chemical properties of external bodies. It is cauſed by volatile particles flying off from odorous bodies, and diffuſed or diſſolved in the atmoſphere, in union with which they enter the noſtrils and affect the nerves of the ſmelling organs. 89 Smelling.

It is difficult to aſcertain what are the eſſential organs of ſmelling. We know that in moſt animals which breathe through lungs or gills, there is either a noſe, or there are certain holes that ſerve the purpoſe of noſtrils; but in many animals there is nothing ſimilar to theſe, and yet there is every reaſon to believe that they poſſeſs the ſenſe of ſmelling in an exquiſite degree. 90 Organs.

Inſects diſcover their food at a diſtance. Butterflies ſeek their females, even when incloſed in boxes; and as they are liable to be deceived by reſemblance of colour, it is evident that theſe inſects are guided in many circumſtances by the ſenſe of ſmell. Thus the fleſh-fly (*muſca vomitoria*) lays its eggs on plants that have a fœtid ſmell, imagining that it places them on corrupted fleſh, and the larvæ which are thus produced periſh for want of their neceſſary food.

As the organ of ſmell, in all animals which reſpire air, is ſituated at the entrance of the organs of reſpiration, the moſt probable conjecture that has been propoſed reſpecting its ſeat in inſects, is that of Baſter, ſince revived by ſeveral naturaliſts, who placed it in the mouths of the tracheæ or air tubes. Beſide many other reaſons that might be ſtated in ſupport of this opinion, we may obſerve, that the internal membrane of the tracheæ appears very well calculated to perform this office, being ſoft and moiſtened, and that the inſects in which the tracheæ enlarge, and form numerous or conſiderable veſicles, are thoſe which ſeem to poſſeſs the moſt perfect ſenſe of ſmelling. Such are all the *ſcarabæi*, the *bees*, *flies*, &c.

The antennæ, which other anatomiſts have ſuppoſed to be the ſeat of ſmelling in inſects, do not appear to Cuvier to poſſeſs any of the requiſites for that organ.

The *molluſca*, which reſpire air, may alſo poſſeſs this ſenſation at the entrance of their pulmonary veſſels; but it is not neceſſary to ſearch for a particular organ of this ſenſe in them, as their whole ſkin appears to reſemble a pituitary membrane. It is everywhere ſoft, fungous, and is always moiſtened by a great quantity of mucous matter. Finally, it is ſupplied with numerous nerves, which animate every point of its ſurface.

The

(A) It is generally ſuppoſed, that the ſenſe of taſting is more acute in ſome of the inferior animals than in man; an opinion which is founded chiefly on the greater ſize and number of the *papillæ* of the tongue in thoſe animals. It is ſcarcely poſſible to decide this point; but we ſhould conceive, from the infinite variety of ſubſtances that are occaſionally ſubjected to the human palate, and from the extreme delicacy of taſte diſplayed by ſome individuals, that man has the advantage of his brute neighbours in this ſenſe.

Of Senfation.

The worms and foft zoophytes, and all the polypes, are probably in the fame fituation. It cannot be doubted but that thefe animals enjoy the fenfe of fmell. It is chiefly by it that they difcover their food, particularly the fpecies that have no eyes. Ariftotle remarked, that certain herbs, which have a ftrong odour, were avoided by *cuttle-fifhes* and the *octopus*.

91 Nature of odour little underftood.

Of all the fubftances which affect our organs of fenfation, odours are the leaft underftood, though the impreffions which they make on the animal body appear to be moft powerful and extenfive. Some bodies are always odorous, becaufe the whole or a part of their fubftance, being volatile, it is conftantly flying off: others become odorous, only under certain circumftances; as when a body containing a volatile principle in its compofition is decompofed by another that has a lefs affinity for that principle, e. gr. when *muriate of ammonia* is decompofed by quicklime.

Odours feem to be propagated in the air, much in the fame manner as one fluid is diffufed through another. Their motion is not direct like that of light, nor is it rapid or fufceptible of reflection and refraction like light and caloric. The odorous particles of volatile bodies may enter into combination with different fubftances, by chemical affinity, and thus lofe their original properties. In this way the effluvia of putrid meat are deftroyed by frefh burnt charcoal, and the noxious exhalations from peftilential apartments are removed by the vapours of nitric or muriatic acid.

Thefe circumftances feem to prove that each fmell is occafioned by a particular fubftance floating in the atmofphere. There are others, however, which appear to indicate that odour is not always produced in this manner.

Several bodies yield a ftrong fmell for a great length of time, without fuftaining any fenfible lofs of fubftance; fuch, for example, is mufk. Some odours are perceived when no evaporation can be obferved, as the fmell which arifes from the friction of copper, that produced by the fufion of a great number of bodies, and even by the melting of common ice. In other cafes, real evaporations produce no fenfible odour; this may be remarked on the difengagement of feveral gafes, and even on the ordinary evaporation of water. Perhaps thefe phenomena prove only that the force of fenfation is not proportional to the quantity of the fubftance by which it is excited, but that it depends on the nature and degree of the affinity of that fubftance with the nervous fluid *. The action of the greater part of odorous fubftances on the nervous fyftem, is rendered manifeft by a number of other effects befides the fenfation of fmell; fome produce faintings, others giddinefs, or even convulfions. Some, on the contrary, ferve to remove thefe diforders: indeed the greater part of medicines act in general rather by their volatile and odorous parts, than by their other principles; and afford new proofs of the influence exercifed in the animal economy by the gafeous and impalpable fubftances, the greater part of which are doubtlefs ftill unknown to us.

* *Cuvier.*

We know not whether odours have a peculiar vehicle, befides the matter of heat, which is common to them all in their quality of vapours or elaftic fluids. We cannot explain why odours are agreeable or difagreeable to us, nor why thofe that are difgufting to us appear pleafing to other animals, and *vice verfa*. Though man and other animals are generally pleafed with the odour of thofe fubftances which ferve them as food; yet when their appetite is fatisfied, this odour often becomes difpleafing to them. On the contrary, fome animals appear to have a paffionate fondnefs for ftrong fmelling fubftances which feem altogether ufelefs to them. Thus cats are extremely fond of *cat-mint*, and the frefh roots of valerian. In general, thofe odours which are moft difagreeable indicate that the fubftances from which they proceed are injurious. Thus venomous plants, putrid flefh, and poifonous minerals, have commonly an unpleafant odour. This rule, however, is not univerfal; and the fenfe of fmell, like that of tafte, is not an unerring guide to man, whatever it may be to other animals.

It appears that the effluvia of odorous bodies are capable of diffufing themfelves through water as well as air; for when thefe fubftances are thrown into water as bait for fifh, we find that thefe animals are attracted by the fmell from a confiderable diftance.

The comparative phyfiology of this fenfe is very curious, though we cannot explain the reafon of the differences that we find to take place in the various tribes of animals. Man in a ftate of civilized fociety, where he may have recourfe to a great variety of means by which to diftinguifh the properties of bodies, has lefs occafion for acutenefs of fmell; but we know that favages are in that refpect greatly his fuperiors. Their fmell is fo acute, that like a blood-hound, they can fcent their enemy to a great diftance, and purfue his track with almoft certain fuccefs. Among birds and beafts of prey we alfo find that acutenefs of fmell is a very general property. Hyænas, wolves, vultures, and ravens, can diftinguifh the putrid carcafes on which they feed many miles off; and it is afferted by naturalifts, that jackalls hunt in packs, and follow their game like hounds by the fcent. There is a curious diverfity in this refpect among birds, fome having this fenfe very acute, others very blunt. We are told by Gattoni *, that the cock is fcarcely affected with the fmell of ammonia or hartfhorn, while the duck is faid to avoid all powerful odours whether agreeable or otherwife. We are not fufficiently acquainted with the nature of the olfactory membrane, nor with that of the nerves diftributed to it, to enable us to form an opinion refpecting the degree and the kind of fenfations they procure to different animals. It may, however, be at firft fight prefumed, that all things in other refpects being equal, the animals in which the olfactory membrane is moft extenfive, enjoy the fenfation of fmell moft exquifitely; and experience confirms this conjecture. It would be curious to learn why the animals which poffefs the fenfe of fmell in the higheft degree, are precifely thofe which feed on the moft fetid fubftances, as we obferve in *dogs* which eat carrion.

92 Comparative phyfiology of fmelling.

* *Scarpa de Auditu et Olfactu.*

Of Hearing.

The fenfe of *hearing* is more important than any which we have yet noticed, but it appears to be lefs generally diffufed. 93 Hearing.

By means of it we become acquainted with thofe properties of bodies which fit them for making fenfible impreffions on the air, as hardnefs, elafticity, &c.; and thefe impreffions on the air, when communicated to the organs of hearing, convey to our mind the ideas of found.

By

Of Senfation. By this fenfe we derive two of the higheft gratifications that we are capable of enjoying, viz. the pleafures of converfation and of mufic; and in this way moft animals hold intercourfe with each other.

94 Organs. The organs of hearing differ exceedingly in the various claffes of animals. The *human* ear and its appendages have been defcribed in ANATOMY, Part I. chap. vi. fect. 4.; and for an account of thefe organs in other animals, we muft refer to *Cuvier's Lectures*, vol. ii. or the *Comparative Anatomy* of Blumenbach, chap. xx. Red-blooded animals without exception have evident auditory organs; and analogous parts are found in many of the white-blooded. In a great number of the inferior claffes, however, no fuch parts have been afcertained, though it is certain that many of them do really hear. In all thofe in which thefe organs have been detected, there is always found a *gelatinous pulp*, covered with a fine, elaftic membrane, and in this *pulp* the ramifications of the auditory nerve are loft. It is therefore, highly probable that the *feat* of hearing refides in the minute nervous fibres that are diftributed through the pulp, and that this latter is the medium by which founds are communicated from the percuffed air. We may form a tolerably juft idea of the manner in which this pulpy fubftance is connected with the external movements that are the caufe of found; for this quivering jelly will readily receive the concuffions of the air or water that are tranfmitted to it from the vibrations of fonorous bodies, and communicate them to the nervous filaments. Thus far only can we trace the motion of found; but the fteps by which this motion is carried on till the perception of found is produced in the mind, are equally unknown to the anatomift and the metaphyfician.

95 Varieties of found. The philofophy of found has already been treated of under ACOUSTICS. It is neceffary here to remark only, that the qualities of found may be diftinguifhed into *force*, depending on the extent of the vibrations of the body from which the found proceeds; *tone*, depending on the velocity of the vibrations; *refonance*, arifing from the intimate compofition of the fonorous body; *fimple modulation of voice* and *articulations*.

96 Comparative phyfiology of hearing. The human ear can diftinguifh all thefe different qualities with relation to one found; this diftinction is made with wonderful accuracy, by perfons who frequently exercife that faculty, and particularly by profeffional muficians. The other mammalia exhibit proofs that they are capable of diftinguifhing the qualities of found which relate to fpeech, that is to fay, *fimple vocal modulations* and *articulations*: for we may obferve daily, that they remember the found and fignification of feveral words. Some are ftrongly affected by certain founds. Acute tones produce a painful fenfation in *dogs*, and we alfo obferve that thefe animals are terrified by violent noifes; they therefore diftinguifh thefe two properties. Birds have a feeling, no lefs exquifite, of *voice, tone, articulation*, and even *refonance*, fince they learn to fing with great correctnefs; and when their vocal organs permit them, can completely counterfeit the human fpeech, with all the modifications practifed by the individuals they imitate.

As to cold-blooded animals, it is well known that feveral of them call each other by certain founds, and that others, which are incapable of producing founds, can at leaft underftand them, as *carps*, which appear when the noife of a bell indicates to them that they are to be fed, &c.; but we know not what qualities of found they diftinguifh, and how far, in this refpect, the delicacy of their fenfe of hearing extends *.

For the morbid affections of hearing, fee MEDICINE, N° 80.

* *Cuvier Comp. Anat.* vol. ii. fect. 13.

5. *Of Seeing.*

97 Seeing. As we afcend from the fimpler to the more complex fenfes, we find a greater fcope for defcription and obfervation; but we alfo find our phyfiological difficulties increafed. The fenfe of touch being the moft fimple of all the fenfes, requires but a fimple organization, and is the moft widely diffufed; that of vifion, on the other hand, is the moft complex, and requires for its mechanifm, a more elaborate fet of organs. There is not, in the whole animal ftructure, a more curious and admirable organ than the eye, whether we contemplate it in its moft perfect ftate in the human body, or in its moft fimple conformation, as it appears in the horn of a fnail.

98 Organs. The anatomy of the human eye has been fufficiently defcribed in the article ANATOMY, Part I. chap. vi. fect. 5.; and if our readers defire a fuller account of this organ, we may refer them to the elegant work of Profeffor Soemmering. The ftructure of the eye in the inferior animals is well defcribed in Cuvier's twelfth lecture, and in Blumenbach's Comparative Anatomy, chap. xvi. We fhall extract from the former a defcription of the eyes of infects and cruftaceous animals, as being among the moft curious and leaft known fubjects of comparative anatomy.

"The ftructure of the eye of infects is fo very different from that of other animals, even the mollufca, that it would be difficult to believe it an organ of fight, had not experiments, purpofely made, demonftrated its ufe. If we cut out, or cover with opaque matter, the eye of the *dragon fly*, it will ftrike againft walls in its flight. If we cover the compound eyes of the *wafp*, it afcends perpendicularly in the air, until it completely difappears; if we cover its fimple eyes only, it will not attempt to fly, but will remain perfectly immoveable.

"The furface of a compound eye, when viewed by the microfcope, exhibits an innumerable multitude of hexagonal facets, flightly convex, and feparated from one another by fmall furrows, which frequently contain fine hairs, more or lefs long.

"Thefe facets form altogether a hard and elaftic membrane, which, when freed of the fubftances that adhere to it pofteriorly, is very tranfparent.

"Each of thefe fmall furfaces may be confidered either as a cornea, or a cryftalline; for it is convex externally, and concave internally, but thicker in the middle than at the edges, it is alfo the only tranfparent part in this fingular eye.

"Immediately behind this tranfparent membrane there is an opaque fubftance, which varies greatly as to colour in different fpecies, and which fometimes forms, even in the fame eye, fpots or bands of different colours. Its confiftence is the fame as that of the pigment of the *choroides*; it entirely covers the pofterior part of the tranfparent facets, without leaving any aperture for the paffage of the light.

"Behind this pigment we find fome very fhort white filaments, in the form of hexagonal prifms, fituated clofe to each other, like the ftones of a pavement, and

precifely

Of Senfation.

precifely equal in number to the facets of the cornea; each penetrates into the hollow part of one of thefe facets, and is feparated from it only by the pigment mentioned above. If thefe filaments are nervous, as in my opinion they appear to be, we may confider each as the retina of the furface behind which it is placed: but it will always remain to be explained, how the light can act on this retina, through a coat of opaque pigment.

"This multitude of filaments, perpendicular to the cornea, have behind them a membrane which ferves them all as a bafe, and which is confequently nearly parallel to the cornea; this membrane is very fine, and of a blackifh colour, which is not caufed by a pigment, but extends to its moft intimate texture; we obferve in it very fine whitifh lines, which are tracheæ, and and will produce ftill finer branches, that penetrate between the hexagonal filaments, as far as the cornea. By analogy, we may name this membrane the *choroides*.

"A thin expanfion of the optic nerve is applied to the pofterior part of the choroides. This is a real nervous membrane, perfectly fimilar to the retina of red-blooded animals; it appears that the white filaments, which form the particular retinæ of the different ocular furfaces, are productions of this general retina, which perforates the membrane I have named choroides, by a multitude of fmall and almoft imperceptible holes.

"To obtain a diftinct view of all thefe parts, it is neceffary to cut off the head of an infect that has the eyes large, and diffect it pofteriorly; each part will then be removed in an order the reverfe of that in which I have defcribed them.

"In the cray fifhes, in general, the eye is fituated on a moveable tubercle. The extremity, which is rounded on every fide, and fometimes elongated into a cone, when viewed by a glafs, prefents the fame furfaces as the eyes of infects. When we cut this tubercle longitudinally, we obferve that the optic nerve paffes through it in a cylindrical canal, which occupies the place of its axis. Arrived at the centre of the concavity of the eye, it forms a fmall button, which detaches very fine filaments in every direction; at a certain diftance thefe filaments meet the choroides, which is nearly concentrical with the cornea, and covers the fpherical brufh of the extremity of the nerve, like a hood. All the diftance between the choroides and the cornea is occupied, as in infects, by white filaments, clofely arranged in a perpendicular direction to each other, and which have the extremity next the cornea alfo coated with a black pigment.

Cuvier's Lectures, vol. ii.

"Thefe filaments perforate the choroides, and are continuations of thofe produced by the button, which terminates the optic nerve."

99 Immediate feat of vifion probably the retina.

The immediate feat of vifion is ftill in difpute; but it appears to be the expanfion of the optic nerve upon the inner coat of the eye. The other parts of that organ ferve to collect, refract, abforb, and fometimes even reflect, the rays of light, according as thefe operations are required for the diftinct vifion of any particular animal. Thofe animals that feek for their prey during night, have a pupil that is very dilatable, and have very little of that dark fubftance called *pigmentum nigrum*, that lies between the retina and the choroid coat in diurnal animals. Thus, the former have their eyes better adapted to receive and to retain the feeble rays of light, and thus poffefs a great advantage over the animals which they purfue, whofe eyes are calculated for feeing beft in a ftrong light.

The fubject of vifion has been fo fully confidered under OPTICS, Part I. fect. 5. that it is unneceffary for us to give any detailed account of it here. We fhall therefore merely enumerate the principal phenomena.

100 Phenomena of vifion.

1. The rays of light proceeding from luminous bodies, are collected by the cornea; varioufly refracted by the aqueous, cryftalline, and vitreous humours, till they meet in a point (in perfect vifion) in the retina, from which the fenfation conveyed to the brain, excites there the ideas of light, colour, and other qualities of extreme objects, of which the eye is capable of judging.

2. The image of the object thus pictured on the retina, is inverted, though the mind is habituated to perceive it as if it were erect.

3. There is a certain point within the eye where the retina is deficient, and here the luminous rays make no impreffion.

4. The eye is calculated to fee objects moft diftinctly at certain diftances or foci, though thefe diftances vary confiderably in different fpecies, and different individuals. A perfon of ordinary fight can read a middle-fized print moft diftinctly at the diftance of about eight inches. Thofe who require a lefs diftance are near-fighted, or *myopes*, and in them the point of divergence of rays is before the retina. Thofe who require a greater diftance are long-fighted, or *prefbyopes*; and in thefe the point of divergence is behind the retina.

5. In thofe animals that have two eyes, an image of a luminous object is formed in each, though the mind is accuftomed to unite both images into one. In ftrabifmus or fquinting, the two eyes not being fimilarly directed, do not concur in producing a fingle object.

6. Though the images of many objects are impreffed on the retina at the fame time, the mind can attend diftinctly to only one of them.

7. In perfect vifion, the pupil contracts or dilates according to the greater or lefs quantity of light that is prefent.

8. When the eye has looked fteadily for fome time on a circumfcribed fpace, of a particular colour, as a piece of red paper placed on a white ground, it perceives a border of a different colour furrounding the original fpot. This furrounding colour is called the *accidental* colour of the former, and differs according to the colour of the original fpot. In the prefent inftance it is green, or bluifh-green. The other natural colours are attended by the following accidental colours, viz. ORANGE, by *blue*, with nearly an equal proportion of *indigo*; YELLOW by *indigo*, with a mixture of *violet*; GREEN by *violet*, with a mixture of *red*; BLUE by *red*, with a mixture of *orange*; INDIGO by *yellow*, with a confiderable mixture of *orange*; and VIOLET by *green*, with a confiderable mixture of *blue* (B).

The

(B) Dr Darwin, in his *Zoonomia*, vol. i. fect. 2. employs the phenomena of accidental colours to prove that the fibres

Of Senſation.

101 Requiſites for diſtinct viſion. The exerciſe of diſtinct viſion depends chiefly on the following circumſtances: 1. The perfect tranſparency of the cornea, and the ſeveral humours of the eye; 2. on the juſt proportional diſtance between the cornea and the cryſtalline lens, and on their degree of convexity; 3. on the ſenſibility of the retina; 4. on the degree of illumination of the viſible object; 5. on the colour of the pigmentum between the choroid and the retina; and, 6. on the contraction and dilatation of the pupil.

102 Action of light on the ſyſtem. The action of light on living beings is not confined to its effects in producing viſion. It ſeems to act on the ſyſtem in general as a moderate but conſtant ſtimulus. When the light of day is vivid, as in bright ſunſhine, the body is more active, and the mind more vigorous, than under a cloudy ſky. Thoſe climates which are frequently obſcured by clouds and vapours, are notoriouſly the birthplaces of ſerioufneſs and gloom; and Bœotian dulneſs and Engliſh melancholy have long become proverbial; while on the contrary, the ſerene brightneſs of an eaſtern ſky has been conſidered as peculiarly favourable to the exertions of imagination, and the flights of fancy. Mr Stuart, a famous pedeſtrian traveller, told Dr Ruſh, that during a ſummer which he paſſed in a high northern latitude, where the ſun is viſible for ſeveral months together, he enjoyed an uncommon ſhare of health and ſpirits, which he attributed to the long continuance of the light of the ſun. In a ſtate of nature moſt animals retire to reſt when the light fails, and few people can ſleep ſoundly, unleſs light be excluded.

The ſtimulating effects of light are peculiarly evident on perſons whoſe nervous ſyſtem is unuſually ſenſible; they cannot bear ſtrong light, which not only hurts their eyes, but produces conſiderable agitation on their whole frame. The ſame effects are produced on thoſe who have been confined in a dark priſon. The countenance of theſe unfortunates is pale and ſallow. This latter effect of the abſence of light is ſimilar to what takes place in vegetables, as we know that the colour, taſte, and ſmell of plants depend on their being expoſed to a due degree of light.

103 Abſence of light ſuppoſed to favour obeſity. It has been remarked, that thoſe animals which have been long confined in a dark ſituation, are univerſally diſpoſed to grow fat; and this has been found to take place even in condemned criminals, in whom we would leaſt expect it. This obeſity has been attributed chiefly to the abſence of light. We are diſpoſed to think that the abſence of this ſtimulus can have no immediate effect, but that the diſpoſition to obeſity depends rather on the indolence of the confined animals, which is favoured by the abſence of light.

For an account of the principal morbid affections of viſion, ſee Medicine, N° 81.

6. *Is there in ſome animals a ſixth ſenſe?*

104 Bats ſuppoſed to have a ſixth ſenſe. From the experiments of Jurin and Spallanzani on the flight of bats that have been deprived of ſight, (ſee Mammalia, N° 38.) it has been ſuppoſed by ſome that the accuracy with which theſe animals in their flight avoided the obſtacles that were placed in their way, is owing to ſome additional ſenſe which they poſſeſs. Others have conceived that the ſenſe of hearing, which appears to be very acute in the ſpecies on which theſe experiments were made, is ſufficient to ſupply their want of ſight. It is ſcarcely poſſible to aſcertain which of theſe two opinions is the more probable; but the writer of this article is rather inclined to adopt the latter, from having obſerved that when he was walking in an unfrequented ſtreet, when it was very dark, he was enabled to avoid running againſt the common ſtairs that projected into the ſtreet, from a certain ſenſation that he perceived, when he approached the wall of the ſtair, which he cannot better deſcribe than by ſaying that the air at theſe points appeared to be unuſually ſtill.

With reſpect to ſenſation in general, we may lay down the following laws, which are conſidered by Dumas as fundamental principles of this function. 105 Laws of ſenſation.

1. As activity is an eſſential character of ſenſation, this cannot exiſt without a certain action of the organs, and muſt be proportioned to the degree of attention beſtowed on the external objects, or ideas by which it is produced.

2. A repetition of the ſame ſenſations tends to render the ſenſibility leſs acute, and leſs capable of receiving new impreſſions. By repoſe its energy is reſtored.

3. As ſenſibility cannot be employed on two impreſſions at the ſame time, it muſt hold a certain balance throughout all the organs, and it cannot be acutely excited in one part, without being proportionably diminiſhed in another.

4. Senſibility is a relative faculty, which is not equally obedient to all kinds of excitations, but only to thoſe which have ſome relation to it in the different parts of the living body.

5. It is increaſed and accumulated in the direct proportion to the defect or weakneſs of ſtimulus.

6. It is not proportioned to the number, arrangement, or diſtribution of the nerves, and its changes of increaſe or diminution are not ſuſceptible of calculation.

7. It is inconſtant, variable in its progreſs, and unconfinable *.

To theſe we may add the following facts reſpecting this function and its organs.

1. The nerves which are principally diſtributed to the organs of the external ſenſes, ariſe from that part of the ſenſorium that is within the head.

2. The ſenſations produced in any part by the contact of external bodies, are more perfect, according as the nerves which terminate in that part ariſe more immediately from the common ſenſorium.

3. When a ligature is faſtened on a nerve, the parts on which the nerve is diſtributed are deprived of ſenſation as far as depends on that nerve.

4. Compreſſion of the brain diminiſhes general ſenſation in proportion to its intenſity. Slight compreſſion produces numbneſs.

5. Though ſenſation probably takes place only in the central parts of the ſenſorium, it is commonly referred to the extremities of the nerves. Thus, a gouty perſon who has loſt his leg, will ſuppoſe that he ſometimes feels

* Dumas, *Principes de Phyſiologie*, tom. ii. p. 151.

fibres of the retina are thrown into contraction, like thoſe of muſcles, and that ſome of them act as antagoniſts to others; as he conſiders the accidental as the reverſe of the natural colours.

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feels the pain of the gout in the toe of the amputated limb.

6. A fympathy takes place between thofe parts which are fupplied by branches of the fame nerve. Thus, a violent fcratching of the head often produces fneezing; powerful odours fnuffed at the nofe produce a flow of tears; the head fympathifes with the ftomach; the mammæ with the uterus, &c.

Thefe are all the phenomena refpecting fenfation which we can at prefent notice; we fhall mention others when we come to confider the relation between this
106 function and thofe of motion, digeftion, circulation, &c.

Internal fenfes belong to metaphyfics.

What have been called the internal fenfes, as memory, imagination, and judgment, are rather qualities of the mind, than operations of the brain; and the confideration of them belongs rather to metaphyfics than phyfiology. To that article, therefore, we refer the reader; and we fhall conclude this account of the phenomena of fenfation with the following comparative view of that function in the inferior animals.

107 Comparative phyfiology of fenfation.

In all animals that have nerves, voluntary motions and direct fenfations take place by the fame means as in man. The differences in their motions depend partly on the intrinfic mobility of their fibres, and partly on the difpofition of their mufcles, and the parts to which they are attached.

The differences in their fenfations depend on the number of their fenfes, and the perfection of the organs belonging to each fenfe. The animals that approach neareft to man have their fenfes equal in number to his. In certain fpecies, fome of thefe fenfes are even more perfect in the ftructure of their organs, and fufceptible of more lively and delicate impreffions than ours; on the contrary, in proportion as animals are removed from us, the number of their fenfes and the perfection of certain organs are diminifhed; but perhaps fome animals, at the fame time, poffefs fenfes of which we can form no idea.

We know not whether there are differences in the intrinfic fenfibility of the nervous fyftem of different animals, i. e. whether an equal impreffion made on an organ equally perfect, would affect every animal with the fame force.

The animals next in order to man have, like him, fpontaneous, or what we call internal, fenfations. Images are excited in them at times, when they receive no immediate impreffion from external objects. Thus, dogs and parrots dream. We are not certain, indeed, that the more inferior animals experience fimilar fenfations.

The paffions produce effects in animals fimilar to thofe which they excite in man. Love is manifefted in the fame manner in all claffes; fear occafions a difcharge of excrements in quadrupeds and birds; it makes them tremble, and even renders infects immoveable; but the other animals afford fewer examples of thefe kind of phenomena than man, becaufe they are not mafters of their imagination, cannot direct it towards certain objects, and create for themfelves factitious paffions. We are even ignorant whether their imaginations can, like ours, be wrought up to fuch a pitch as to make them experience emotions of anger, defire, or fear, from fimple ideas or fimple recollections; and whether the real prefence of the objects which caufe thefe paffions, is not always neceffary to excite them in the inferior animals; we know, however, that thofe which approach neareft to us, the mammalia and the birds, have their forrows. The affliction they feel on the abfence or lofs of a companion, friend, or benefactor, is manifefted by evident figns, in the fame manner as they teftify their attachment without any temporary inducement.

The fame animals exhibit frequent proofs of a very perfect memory; fome even appear to poffefs a certain degree of judgment. But does any thing fimilar exift in the inferior claffes, and particularly in the loweft? Of this we fhall probably remain always ignorant.

With fo much refemblance in the ftructure of the nervous fyftem, in its mode of action, and in the number and ftructure of the principal external organs, why is there fo vaft a difference, as to the total refult, between man and the moft perfect animal?

Is this owing to a more accurate proportion in the relative perfection of the external organs, fo that one does not fo much furpafs another? Or has the internal organ, in which are performed all the intermediate operations between the fenfation received and the movement executed, that is to fay, the organ of perception, memory and judgment, greater differences than we have yet obferved? Or, finally, is the fubftance by which thefe proceffes are effected of a different nature? Thefe, however, are not anatomical queftions.

The fympathies or effects refulting from the connections of nerves with each other, and the influence of the nerves on vegetative functions, are fubject to the fame laws in man and the other animals *.

108 Theory of fenfation.

The theory of fenfation is perhaps more imperfect than that of any other function. On this fubject we can derive little light from the ftructure of the brain and nerves, accurately as this has been examined. Anatomy has taught us, that the principal part of thefe organs confifts of very delicate fibres, intermixed with a medullary pulp, and incafed in membranes; and that they are furnifhed with a great proportion of blood-veffels; but whether the feat of fenfation refides in the fibrous or medullary part, we cannot afcertain.

It was formerly the opinion, that the nervous power was propagated between the brain and the external organs, by vibrations of the nerves; but as the ftructure of thefe chords, and their connection with furrounding parts, muft wholly difqualify them for fuch vibrations, this theory has long been abandoned. 109 Vibration.

Another hypothefis that has been very generally received is, that the nervous fibres are the conductors of a very fubtile fluid, called the nervous fluid, the motions of which are the caufe of fenfation. This was the opinion of Dr Haller, (*Firft Lines*, chap. x.) and was ftrenuoufly maintained by Dr Cullen. We fhall prefent our readers with the following modification of it, as given by an able difciple of Cullen. 110 Nervous fluid.

"It is probable, (fays this writer), that in each nervous fibril, an elaftic fluid is inherent, forming, from the moment of animation, a part of it; differing, however, according to the ftate of the conftitution, in power, mobility, and, perhaps, in other qualities. Of this fluid the nerves are conductors, and are furrounded in their courfe by non-conducting membranes, while the fame membrane lines every part of the brain, and is carried into the deepeft cavities, guarding with particular attention the flighteft aperture. In this view fanguiferous veffels are chiefly ufeful in nourifhing this medullary fubftance, and they appear to be neceffary alfo in adapting the

* Cuvier's *Lectures*, vol. ii.

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the nerves to their office; for, when the circulation is greatly increaſed, the ſenſibility is more acute; and when it languiſhes, or is deſtroyed, the nervous energy ſoon ſhares the ſame fate.

"This fluid muſt neceſſarily be an elaſtic one; and impreſſions are apparently conveyed through it by vibrations. It does not follow from hence, that the nerves vibrate like muſcular cords; or that, in every the ſlighteſt motion, a portion is conveyed from the brain. The elaſticity of the fluid is proved from the momentary continuance of the impreſſion after the cauſe is removed; and vibration is a term employed in many branches of philoſophy as a means of communicating motion, without any diſtinct application. If we touch an object with a ſtick, or with a metallic rod, we perceive through it the impreſſion, and, in a general way, the nature of the ſubſtance. The impreſſion muſt be conveyed by ſomething; and whatever that ſomething is, it may as well convey impreſſions through the nerves as through the rod. But through the nerves only can it affect the brain, and produce an *idea*, or ſome change in the brain, or its fluid connected with the nature of the object, and which conveys to the mind ſome peculiar and diſcriminated impreſſion which it afterwards retains *."

A third hypotheſis, which is at preſent very faſhionable, is, that ſenſation is produced by a change in the ſubſtance of the brain and nerves. M. Cuvier is an advocate for this doctrine, which he illuſtrates in the following manner.

* *New London Medical Dictionary*, vol. i. p. 398.

The nervous ſyſtem is ſuſceptible of two kinds of action; one which is confined to our ſenſitive faculty, and another which affects our vital and vegetative functions only. External ſenſations are produced by the impreſſions of external bodies, on our ſenſes; internal ſenſations, by changes which take place, in the ſtate of the internal parts of the body, to which the nerves are diſtributed; and ſpontaneous ſenſations are cauſed by a change in the nerves, or in the brain itſelf, without any external excitement.

Theſe circumſtances, added to the phenomena ariſing from the cutting or tying of nerves, ſhow, that ſenſation does not reſide in the external organs, but nearly in the centre of the nervous ſyſtem, and that the external organs ſerve only to receive the action of the external bodies, and to convey it to the nerves, by which it is propagated to a greater diſtance. They alſo demonſtrate, that this propagation is not produced by any matter or concuſſion, but by a change in the ſtate of the nervous ſubſtance. This change may ariſe from internal cauſes, or it may be produced by external cauſes, different from thoſe which uſually occaſion it. The nerves are not merely paſſive agents, nor the conductors or reſervoirs of any particular matter; but it appears, that the ſubſtance which produces ſenſation, is liable to be conſumed, or to loſe its activity by exertion.

There are phenomena which ſhew that the general ſuſceptibility of the nerves, for receiving ſenſations, may vary in conſequence of cauſes external to the nerves themſelves, and which can operate only by altering their ſubſtance. Certain medicines weaken or revive that ſuſceptibility;—inflammation frequently increaſes it to an exceſſive degree. Does this take place in conſequence of an increaſed ſecretion of the nervous matter? The moſt remarkable change that occurs in the ſuſceptibility of nerves, is ſleep. It is not unnatural to ſuppoſe that this change may be occaſioned by the temporary loſs of the ſubſtance which is eſſentially ſenſitive. But how does it happen that ſleep depends, in a certain degree, on the will? Why do we awake ſuddenly, or from cauſes which do not appear calculated to reſtore that ſubſtance? Why does cold produce ſleep? From theſe obſervations, may it not rather be ſuppoſed that this ſtate is the effect of a change in the chemical nature of the nervous ſubſtance?

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But whether the ſubſtance contained in the nerves is exhauſted by ſenſations, or whether it merely undergoes an alteration in its chemical compoſition, and becomes, as it were, neutralized, it muſt remain in the nerve throughout the whole of its courſe, and leave it only at one of its extremities. It does not, however, reſemble the blood in the veſſels, either as to the manner in which it is retained, or in which it moves in the nerve. There is no evidence of the nerves being tubular. No phenomena indicate that any matter eſcapes from them when they are divided. Beſides, what veſſels could have parietes ſufficiently compact to retain ſo ſubtile a fluid as that of the nerves muſt be. It is far more probable that it is retained in the nerves, in the ſame manner as the electric matter is in electric bodies, by communication and inſulation; and that the nervous ſyſtem is its only conductor, while all the other parts of the animal body are, with reſpect to it, cohibent ſubſtances *.

The theory of *ſenſorial power*, brought forward by Dr Darwin, has already been noticed.

* *Cuvier's Lectures*, vol. ii.

Chap. III. *Of Irritability*.

III General phenomena of irritability.

1. When any part of a living animal body that contains muſcular fibres, as a part of its compoſition, is touched with a ſharp inſtrument, with a hot iron, or with a corroſive liquor, or when a ſhock of electricity or galvaniſm is made to paſs through it, a contraction takes place in the part; and this contraction is diſcontinued when the ſtimulus is removed, but is renewed on repeating the application.

2. The ſame contractions take place in certain parts of a living animal body, from an exertion of the will.

3. Many parts in which the preſence of muſcular fibres has not been aſcertained, poſſeſs the ſame capacity of being excited to motion by ſtimuli. Such are the ureters, the biliary ducts, the ſmall blood-veſſels, and probably the lymphatics; all of which, though not evidently muſcular, have a fibrous ſtructure.

4. Some parts of the living animal body which appear rather nervous than muſcular, poſſeſs a contractile power, as the retina.

5. When the nerves which form a communication between a contractile part and the brain, in the higher orders of animals, are divided or compreſſed, thoſe parts which before contracted in obedience to the will, loſe this power; but,

6. Theſe parts, as well as every muſcular part, ſtill contract on the application of ſtimuli, particularly electricity and galvaniſm.

7. Such parts of an animal body as have muſcular fibres, are thrown into contraction on the application of ſtimuli, for ſome time after having been ſeparated from the living body, provided that nervous filaments remain connected with the muſcular fibres.

8. It has been found, that the fibrine of the blood is

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susceptible of contraction on the application of the galvanic stimulus, after having been separated from the living body.

9. In some animals in which a nervous system has not been detected, as polypes, this contractile power seems to pervade every part of the animal.

10. Plants, in a greater or less degree, possess the power of moving on the application of stimuli; and in some species this motion is very remarkable. See N° 57.

The above are some of the principal phenomena which take place in organized beings with respect to irritability. They are so analogous, that we may attribute them to the same cause or the same vital power. This susceptibility of being thrown into contraction on the application of stimuli is called irritability; and it is possessed in a greater or less degree by every organized being with which we are acquainted.

112 Definition of irritability. We have restricted the term *irritability* to denote the susceptibility of the fibrous structure to contraction on the application of stimuli; but it is proper to remark that this term has not always been used in the same sense.

113 Different applications of this term. Irritability has long been employed in medicine, as in common language, in reference to the passions, especially that of anger; and this appears to have been the original meaning of the term.

Multa fero ut placem genus irritabile vatum. Hor.

It is perhaps still more common to apply it to a morbid sensibility of the system; and we speak of a person being of a very irritable habit, or possessing a great degree of irritability, when we mean to say that he possesses a more than ordinary share of sensibility, liable to a more keen sensation of the same impressions.

"Or are your nerves too irritably strung."
Armstrong.

Even the accurate Dr Whytt, to whom the proper distinction between irritability and sensibility must have been familiar, and by whom it is in general strictly regarded, sometimes falls into this inaccuracy. He speaks, in his work on nervous diseases, of "a delicate or easily irritable nervous system." In fact, this confusion of irritability with sensibility, appears to be a stumbling block to most physiological writers. We shall presently inquire how far they are independent of each other.

The term irritability, in its most received acceptation, as a property of the muscular fibre, seems to have been first employed by Glisson, about the middle of the 17th century. He distinguishes two kinds of irritability, primary or direct, and secondary or sympathetic *. Haller was, however, the first, who treated of irritability with any degree of accuracy. He confines it to the muscular fibre; though at the same time he will not allow it to many parts, the muscularity of which has never been questioned, and which, since his time, have, by decisive experiments, been proved to possess a considerable degree of contractile power. He completely distinguishes irritability from sensibility, with which he will have it to be totally unconnected; and he attempts to make a distinction between the irritability of the living, and that of the dead fibre †.

* *Glisson de Ventriculo et Intestinis.*

† *Haller's First Lines of Physiology*, chap. 11.

Dr Whytt, whose controversy with Haller respecting the nature of irritability and sensibility is famous in the annals of medical warfare, admits three kinds of irritability: 1. That power of alternate contraction and dilatation which is peculiar to those organs we call muscles; 2. That uniform contraction which takes place in the dartos (one of the coats of the scrotum) and the pores of the skin; and, 3. That redness and inflammation, which is excited in every sensible part of the body, as often as acrid things are applied to it; although this last is allowed by him to be only an effect of the first kind of irritability taking place in the small vessels of the part ‡. Thus, he reduces the three kinds to two, and we may perhaps consider his second kind only as a modification of the first.

‡ *Whytt's Physiological Essays*, Essay ii. part 2.

Among those who seem to have a sufficiently just idea of the nature of irritability, the word itself is not unfrequently misapplied. Thus, Vicq d'Azyr ||, and Dumas §, in enumerating the functions of the animal body, called those of motion and sensation, irritability and sensibility. These latter are powers or capacities of living beings, and as such should be distinguished from the functions that depend on them.

|| *Encyclop. Method. Anatom. Comparée.*

§ *Principes de Physiologie*, tom. 1.

In considering the phenomena of irritability, it is necessary to take notice of the several kinds of stimuli which excite it. These have been reduced by Cuvier to five orders, viz. *volition; external actions* operating on *nerves; external actions* operating on the *fibre* itself; *mixed actions* operating on both the *nerves* and *fibres*, and certain *diseases* or *violent emotions*. 114 Stimuli exciting irritability.

When the animal body is in a state of health, and awake, the will exercises a prompt and constant influence over the greater part of the muscles, which, on that account, are denominated *voluntary* muscles. A small number of muscles, viz. those which produce the internal movements necessary to life, and which cannot be interrupted, such as the heart and the alimentary canal, are not subject to the will. It must be observed, however, that some of the muscles, that in man and most other animals are involuntary, are subject to the will in others. This is the case with the stomach in ruminating animals, the movements of which may be exerted at pleasure in two different directions. In some muscles, as in those of respiration, there seems to be a mixed action with respect to the will, as this faculty can interrupt their motion for a time, though, in general, this is continued from habit, without the will, or even consciousness of the animal. Those muscles that are absolutely involuntary, are continually excited by an extraneous irritating cause; for the blood which is brought to the heart on every dilatation, determines that organ to contraction, and the alimentary canal is affected in the same manner by its contents. It seems, therefore, that the will is not essential to the action of these muscles, and that it cannot interrupt their motion (c). 115 Volition.

A

(c) There are facts which shew that the will has often considerable influence even on muscles that are universally styled involuntary. The abbé Fontana, when making experiments with *wheel polypes*, was led to believe that the heart, in these animalcules, is a *voluntary* muscle, and from this belief he learned, in some degree, to accelerate

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A muſcle laid bare, and expoſed to an irritating cauſe, will contract itſelf, even in the living ſubject, without being influenced by the will. It ſhould ſeem, therefore, that though the muſcles which we call voluntary, are uſually put in motion by the will, they may yet be excited to action in oppoſition to that faculty.

116 Nervous energy. The will itſelf ſeems to act only through the medium of the nerves; and it is found that thoſe nerves which ſupply the voluntary muſcles, are generally the largeſt.

117 External ſtimuli. The external ſtimuli that act on the muſcular fibre through the medium of the nerves, and on the fibre itſelf, are chiefly of a mechanical and chemical nature, as concuſſions, punctures, lacerations, all of which are capable of producing convulſive motions in all the muſcular parts to which the nerves extend.

118 Galvaniſm. One of the moſt remarkable of theſe ſtimuli is the galvanic influence. It is well known that the experiments by which this influence is made to act on the muſcular fibre, conſiſt in eſtabliſhing between a muſcle and the trunk of the nerves which extend to it, an external communication with one, or a ſeries of ſubſtances placed cloſe to each other. Metals are not the only means that may be employed in this operation; and in general, the conductors are not the ſame as thoſe of electricity. Experiments have ſometimes been ſucceſsfully performed, when an interval was left in the ſeries of excitators: this circumſtance, in the opinion of Cuvier, proves the exiſtence of an atmoſphere.

The moment the contact takes place, the muſcle ſuffers violent convulſions. Theſe experiments ſucceed on the living body, or animals recently dead, and even on parts ſeparated from the body, preciſely in the manner of thoſe which Haller accounts for on the principle of irritability. Neither pointed inſtruments nor acrid liquors are neceſſary; and the galvanic experiments even ſucceed when theſe means have failed.

119 Diſtenſion. Diſtenſion has been obſerved to have a powerful effect in exciting irritability.

120 Violent paſſions. Violent paſſions may, to a certain degree, be conſidered as the acts of the will ſtrongly excited. Theſe, in ſome caſes, have an influence even on the involuntary muſcles; for it is no unuſual thing for palpitation of the heart, and ſometimes even a ſuſpenſion of its motion, to be the conſequence of ſtrong paſſions. Theſe actions, however, are to be prevented by moderating the exceſs of ſenſibility by which they are occaſioned. Even in nervous diſeaſes, which appear to be the leaſt connected with thoſe paſſions whoſe influence is more immediately felt, the will is often capable of preventing or retarding the approach of nervous ſymptoms, when the patient is determined to reſiſt the paroxyſm.

From what has been ſaid, it appears that, in the ſuperior claſſes of animals, all the orders of ſtimuli, either act through the medium of the nerves, or that they are capable of being modified or controuled by the will, the exertion of which depends on nervous influence.

121 Cauſe of irritability. With reſpect to the immediate cauſe of irritability, there have been ſeveral opinions. One of thoſe which has been moſt generally received is, that irritability is intimately connected with ſenſibility; or, that it is an immediate effect of the nervous power. This was the opinion of Whytt and Cullen, the former of whom endeavours to prove it by the following arguments.

122 Whytt's arguments in ſupport of nervous influence.

1. We almoſt always obſerve the irritability of the muſcular organs of the human body to bear a proportion to their ſenſibility. Thus, children, and people of delicate nerves and very quick feelings, are moſt ſubject to convulſive and ſpaſmodic diſeaſes, while on the other hand old people, and thoſe of leſs delicate ſenſibility, have a muſcular ſyſtem that is not ſo irritable.

2. Whatever increaſes the ſenſibility of the muſcles, alſo increaſes their irritability.

3. Whatever leſſens or deſtroys the ſenſibility of the muſcles, alſo leſſens or deſtroys their irritability or power of motion.

4. That the motions of irritated muſcles are owing to the ſenſation excited by the ſtimulus applied to them, Dr Whytt thinks highly probable, if it be conſidered that we are in fact conſcious of many involuntary motions in our own bodies, proceeding from a particular ſenſation, either in the organs moved, or in the neighbouring parts *.

Dr Cullen was ſo fully convinced of the neceſſity of nervous influence to produce muſcular contraction, that he conſidered the muſcular fibre to be only a continuation of the nervous fibre. See MEDICINE, N° 73.

* *Phyſiological Eſſays*, Eſſay ii.

123 Haller's opinion of the *vis inſita*. Haller, as we have ſaid, ſtrenuouſly maintained, that irritability was quite independent of the nerves, and was an inherent power or *vis inſita* of the muſcular fibre. Indeed there are ſeveral circumſtances which would induce us to believe that irritability is at leaſt, in ſome caſes, independent of nervous influence. We have ſeen (N° 111.) that it takes place in thoſe animals in which there is no appearance of nerves; and that it is very remarkable in ſome ſpecies of vegetables, in which none but the moſt fanciful phyſiologiſts have dreamed of finding a nervous ſyſtem. Nay, it appears that the fibrine of the blood, which we can ſcarcely ſuppoſe to be affected by the nervous power, when taken out of the body, is ſtill ſuſceptible of irritation.

124 General concluſion on this ſubject. From a compariſon of all theſe circumſtances, we muſt either conclude, that the irritability of living muſcles, and of the ſuperior animals, is different from that of the fibrine, of polypes and plants; or, if we admit that nervous influence is eſſential to irritability, we muſt alſo allow that this influence deſcends to the latter claſs of organized bodies.

125 Chemical doctrines of irritability. Before we quit the ſubject of irritability, we muſt notice the chemical hypotheſes that have been lately propoſed, to explain the immediate cauſe of this faculty.

126 Girtanner's opinions. The firſt of theſe is that of Girtanner, who conſidered oxygen as the principle of irritability. The

arguments

celerate and retard the motion of his own heart. We have even heard of a perſon who had ſuch a command over both heart and lungs, that he could, at pleaſure, arreſt the motion of both, and aſſume all the appearance of a lifeleſs corpſe. Many of thoſe muſcles, which, in ordinary ſubjects, are not obedient to the will, as thoſe of the *noſe* and *external* ear, may, however, become ſo by habit or patient aſſiduity in cultivating their action.

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arguments on which he founded this opinion are the following.

1. The irritability of organized bodies is always in a direct ratio to the quantity of oxygen they contain.

2. Every thing that augments the quantity of oxygen in organized bodies augments at the same time their irritability.

3. Every thing that diminishes the quantity of oxygen diminishes likewise their irritability.

He distinguishes the organized fibre by three different states:

1. A state of health, or the *tone* of the fibre, in which the oxygen exists in its proper quantity.

2. A state of *accumulation*, in which the fibre is overcharged with the oxygen or irritable principle.

3. A state of *exhaustion*, in which the fibre is more or less deprived of it.

He likewise arranges the substances, that are capable of coming into contact with the irritable fibre, into three classes.

The first comprehends those substances that have the same degree of affinity for the irritable principle or oxygen, as the organized fibre itself; hence the substances produce no effect upon it.

The second comprehends those substances that have a less degree of affinity for oxygen than the organized fibre has: hence these, when they come into contact with it, surcharge it with oxygen, and produce a state of *accumulation*. They are called negative stimuli.

The third comprehends substances for which oxygen has a greater affinity than it has for the organized fibre. These, therefore, deprive the fibre of its oxygen, and produce a state of exhaustion. They are called positive stimuli.

By way of answer to this fanciful doctrine, we may observe, that if oxygen were so essential to irritability as is supposed in Girtanner's positions, those animals which respire most oxygen should possess most irritability, and those which are capable of living for a long time in deoxygenated air, should have their irritability very low. Now, the reverse of this is found to take place. The muscular fibres of birds which respire more oxygen than most other animals, possess but little irritability, while reptiles and worms, which can live for a long time without oxygen, are universally and strongly irritable *.

* Johnson's Animal Chemistry, vol. iii.

127 Hypothesis of Humboldt.

The other opinion is that of Humboldt, who considers the galvanic fluid as the source of nervous power, and the primary cause of irritability. He lays down three principles as necessary to excite irritability; viz. 1. Oxygen, which forms combinations with different acidifiable bases. 2. The acidifiable bases (carbone, hydrogen, azote, and phosphorus), of the fibre, with which the oxygen may combine. And, 3. The galvanic fluid.

The galvanic fluid produces, according to Humboldt, the same effect in the animal economy, as the electric fluid in the mixture of azote and oxygen. It is this galvanic fluid that, being conveyed by the nerves, brings about the combinations of the oxygen with the different acidifiable bases of the fibres; but when the nerve of a part is tied, it prevents the fluid from passing, which explains the reason of the irritability being destroyed.

The oxygen necessary for these unions is carried by the arterial blood in the course of circulation; and the acidifiable bases, which are to unite with it, are found to be already present in the fibre.

He found that every thing that augments too much the quantity of the acidifiable bases diminishes the irritability; and that every thing that increases too much the quantity of oxygen, likewise diminishes it; and he thinks it very probable, that the same takes place with respect to the proportion of the galvanic fluid.

It is therefore only in a just equilibrium of these principles that the necessary irritability of the parts consists.

Upon these principles this philosopher thus explains the production of muscular motion. "In a state of repose, the nerve being inserted in the muscles, the galvanic fluid is put into equilibrium in organs that touch each other. The spontaneous motion is made by a surcharge of galvanic fluid into the nerve. It appears that the instant we wish to make a motion, the galvanic fluid produced in the brain, is carried *en masse* towards the part that ought to move, and surcharges the nervous fibres. A discharge from the nerve is then made into the muscles. The particles of these last, animated by increased affinities, approach each other, and it is this that constitutes the phenomena of muscular motion *."

* Johnson's Animal Chemistry, vol. iii. p. 24.

Dumas lays down the following fundamental laws respecting animal irritability.

128 Laws of irritability by Dumas.

1. The essential characteristic of irritability consists in a series of contractions and dilatations, determined either by the impression of an external stimulus, or by the simple exertion of the will.

2. Irritability is independent of the action of the nerves; and though generally diffused throughout the animal organization, it belongs rather to the muscular fibre than to any other structure. Its action is in proportion to the number of fibres upon which the irritating causes can exert their influence.

3. Irritability is a relative faculty which is not indiscriminately obedient to every species of excitation, but only to those which have some relation to it in the different parts of the living body.

4. There belongs to each organ a specific irritability which requires a peculiar stimulus, accommodated to its nature, and to the kind of functions which it exercises.

5. Irritability has certain vicissitudes of diminution and increase, which vary in the different species of animals, in the different organs of the same animals, and under the different circumstances that successively occur in the life of an individual.

6. Irritability is developed with most energy at the moment of death, and immediately after this has taken place.

7. It is multiplied and revived in proportion as the organ which has lost it is divided into a greater number of pieces.

8. It diffuses itself in each part with a velocity proportioned to the activity, number, and duration, of the irritations by which it is excited.

9. There exist mutual relations with respect to influence between sensibility and irritability, though each of them is essentially distinct from the other.

10. The exercise of this faculty supposes in the organs a moderate degree of cohesion, above or below which the action of this force is enfeebled, obstructed, or opposed *."

* Principes de Physiologie, tom. iii. p. 53.

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Chap. IV. *Of Animal Motion.*

129 Organs of motion.

The organs of motion vary confiderably in their nature and connection in the different claffes of animals. In fome tribes, as in the animalcules and polypes, no diftinct organs can be obferved. In all above thefe, however, there are evident mufcular fibres, and in many there are hard parts or ftrong membranes, which ferve as points of attachment and fulcra of motion to thefe fibres. The mufcular fibres are to be confidered as the effential moving organs, while the parts to which they are attached are merely the paffive functions of this organ. It would be out of place here to enter on a comparative account of the organs of motion; and there is the lefs occafion for it, as they have been more or lefs fully defcribed in the former part of the work. The bones, ligaments, mufcles, and tendons, with their appendages, as they appear in man, have been amply defcribed in the firft and fecond chapters of the Firft Part of ANATOMY; and thofe of other animals have been briefly noticed in the Second Part of that article. Such of our readers as wifh for a more particular account, may confult Cuvier's Lectures, vol. i. or Blumenbach's Comparative Anatomy, chap. 1, 2, 3, 4, 5, and 22.

130 Principles of mufcular action.

Many of the phenomena of mufcular motion, as they take place in man, have alfo been related under ANATOMY, N° 85 and 86. We fhall here therefore only enumerate and briefly illuftrate thefe phenomena, and fhall then proceed to confider a moft interefting part of the phyfiology of motion, the progreffion of different animals.

Dr Barclay, in his late excellent work on the mufcular motions of the human body, has confidered the general fubject of mufcular action under the following heads, which may be confidered as fundamental principles.

1. Flefhy fibres that are continued into tendon by a ftraight line, fhorten the mufcle which they compofe, in the fame degree in which they fhorten themfelves; thofe fibres which enter the tendon obliquely, fhorten it more, and ftill more in proportion to their degree of contraction, as they deviate more from the line of the tendon, and approach nearer to the perpendicular, in which laft direction they would fhorten the mufcle moft with the leaft contraction.

This may be illuftrated in the following manner.

Plate CCCCXVII. fig. 1.

Let AB (fig. 1.) reprefent a tendon, and CD a flefhy fibre; and let us fuppofe that AB is the diameter, and CD the radius of the fame circle ADB. It is evident that if the fibre CD fhould contract fo as to bring the point C of the tendon to the point G in the ftraight line, the extremities of the tendon A, B, (which are fuppofed to be moveable) would come refpectively to E and F; and the fituation of the tendon itfelf would be reprefented by the angle EGF. If the fibre could be fuppofed to contract fo as to bring the point C to D, the two parts of the tendon CA and CB, would come in contact. If, on the other hand, the fibre CH, which enters the tendon obliquely, were to contract to H, fo as to bring the point C to H, the point A would be drawn but a little beyond the middle point C, fo that although this latter fibre is contracted to as great an extent as the former, it has not brought the extremities of the tendon fo near together.

2. When two fibres enter a tendon on oppofite fides and contract at the fame time, they will draw the tendon in the diagonal, and the more nearly the angles which they form with the tendon approach to right angles, the more will the length of the mufcle be fhortened in proportion to the degree of contraction of the fibres.

Let the fibres BC, BD, BE, BF, BG, (fig. 2.) be flefhy fibres, inferted into the tendon AB, at the point B, and let us fuppofe that all thefe fibres co-operate in bringing the point B to the point G, in the ftraight line BG. Now the ftraight fibre BG will be fo much fhortened when B comes to G, as to be obliterated, while the oblique fibres EB and FB will be fhortened only to E *a* and F *b*, and the more oblique fibres CB and DB will remain of the length of C *c* and D *d*. Fig. 2.

3. All mufcles that are inferted into bones, are thereby furnifhed with levers, and as in the action of all levers there are alfo a fulcrum, a power, and a refiftance, thefe in different cafes will be differently fituated with refpect to one another.

a. In the motions of the head backward and forward on the atlas, the fulcrum is fituated between the power and the refiftance; or the lever is of what is called in mechanics, the firft kind. See MECHANICS, N° 33.

b. When the tibia refts upon the aftragalus, and the heel is raifed by the mufcles of the calf of the leg acting on the tendo achillis, the refiftance (which in this cafe is the preffure of the tibia) is fituated between the power and the fulcrum, which are here refpectively at the heel and at the toes; or the lever is of the fecond kind.

c. In raifing a weight at the palm of the hand, and bending the arm at the joint of the elbow, the power of action in this joint is fituated between the refiftance and the fulcrum, which are here refpectively at the palm of the hand and the *diftal* extremity of the humerus (D), or the lever is of the third kind.

The fhortnefs of the lever, and the confequently great force of the mufcular power required to overcome the refiftance in this laft cafe, may be thus illuftrated. Let AB (fig. 3.) reprefent the *radius* articulated at B with the *humerus* BC; let DFE reprefent the *biceps flexor* mufcle running along the *humerus*, and attached to the *radius* at E; and fuppofe a weight W hung to the diftal extremity A of the *radius*. Now, BH will reprefent the lever of refiftance, and BG perpendicular to it the lever of the mufcle, which is in this cafe extremely fhort. Fig. 3.

4. As, other things being equal, all mufcles produce a greater extent of motion by a lefs proportional degree of contraction, and confequently a lefs proportional change in their fibres, than if they were fhorter; thofe mufcles which follow a direct courfe are feldom attached at the neareft points of the two bones with which

(D) In Dr Barclay's nomenclature, that extremity of a bone which is towards the trunk is called *proximal*, and that extremity which looks from the trunk is called *diftal*.

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which they are connected. Hence, beſide the advantages already mentioned, relations are thus formed between parts at a diſtance, and the mutual dependence of the functions and their organs is extended and ſtrengthened. On the contrary, thoſe muſcles that are not extended along the ſurface of the bones to which they are attached, are obſerved to follow an oblique direction, by which they acquire not only contractibility and length, but at the ſame time a ſhorter lever than if they had been inſerted at the ſame place with a leſs obliquity.

5. Of muſcles attached to ribs that are parallel, equally moveable, and at right angles to the vertebral column, thoſe that follow a direct courſe from one to the other, will act on each by equal levers, and make them approach with the ſame velocity; while thoſe that obſerve an oblique courſe will act on each by different levers, and make them approach with different velocities.

Fig. 4. Let AB and CD (fig. 4.) repreſent two parallel ribs, articulated with the vertebral column at A and C, where they are equally moveable; and let DB and DE be two muſcles, the former obſerving a direct, and the latter an oblique courſe. The levers of DB will be AB and CD, which, as AC is parallel to BD, are evidently equal; but the levers of DE will be CF and AG, which being of different lengths, the muſcle muſt act with different degrees of force on the different ribs, ſo that it will make CD, on which it acts with the longeſt lever, approach AB, faſter than it will make this latter approach the former.

Corollary.—When bones are not parallel, the muſcles that croſs in the interval between them, muſt fall obliquely on both, as it is impoſſible for a ſtraight line to be at the ſame time perpendicular to two other lines, unleſs theſe be parallel.

6. As all bones move on a centre or axis of motion, while the muſcular attachments move in a circumference, the muſcles, in changing the relative poſition of any two bones, muſt, at the ſame time, be changing the direction of their own action, and varying their lever.

Fig. 5. Let AB and CD (fig. 5.) repreſent parts of two parallel ribs, and let AB be moveable on the centre A, and let CF and GE be two muſcles inſerted obliquely into AB at F and E. Now ſuppoſe that by the action of theſe muſcles, AB is brought into the poſition A *b*. The points of attachment of the two muſcles to AB, will now be *f* and *e*, and the muſcles will be C *f* and G *e*, having changed their length, ſituation, obliquity, and lever.

7. All muſcles where the points of attachment move in a circle, draw either towards the centre, or towards the circumference.

8. If any two bones could, by the action of their muſcles, be made to approach in a parallel direction, the oblique muſcles attached to their parallel and approaching ſurfaces, would perform a greater extent of motion with a leſs ſhortening of their fibres, than any ſtraight muſcles attached to the ſame parallel ſurfaces. Of Animal Motion.

Let AB and CD (fig. 6. and 7.) be parts of two ribs that are parallel, and that will continue parallel till they are brought in contact by the action of the ſtraight muſcles AC, EF, and BD, or by the action of the oblique muſcles CE and DE (fig. 7.) and FA and FB (fig. 6.). It is evident, that when the point E comes in contact with F, the length of the ſtraight muſcles muſt be obliterated, while that of the oblique muſcles will only be ſhortened by *c* E and *d* E in fig. 7. and *f* A and *g* B in fig. 6. Fig. 6. & 7.

9. As, however, no two bones can approach one another in a parallel direction, at leaſt by the action of a ſingle muſcle, and as no muſcle can continue to act in a direction perpendicular to their two approximating ſurfaces; a muſcle entering them at right angles, when they are parallel, may be placed ſo near to the centre of motion as to carry the bones through a given ſpace, with a leſs ſhortening of fibres than any oblique muſcle that has the ſame origin, but is inſerted at a diſtance, and acts through the medium of a longer lever. Further, a muſcle with a leſs obliquity may be ſo ſituated as to carry the bones through a given ſpace, with a leſs ſhortening of fibres than any other muſcle of the ſame origin, but of a much greater obliquity.

Let AB and CD (fig. 8.) be two ribs, of which AB is moveable about the centre A; and ſuppoſe that by the ſhortening of the ſtraight muſcle EF, and of the two oblique muſcles, EG and EH, AB is brought into the poſition A*b*. The points of attachment, after moving in the ſegments F*f*, G*g*, and H*h*, will now be reſpectively at *f*, *g*, and *h*. Now, on the centre E, with the radii E*f*, E*g*, and E*h*, deſcribe three different circular ſegments. The difference between the preſent and former lengths of the moſt oblique muſcle EH, will be *e*H, while the differences between the preſent and former lengths of the muſcles EG and EF, will be only *e* G and *n* F reſpectively. Fig. 8.

10. The ſhortenings which any muſcle ſuffers in carrying round the point of its attachment through a given ſpace, will partly depend on the length of its lever, partly upon its degree of obliquity, partly on its drawing *peripherad* or *centrad*, and partly on its acting without or with a pulley (E).

11. The lever of a muſcle, which is varied with every degree of obliquity, is alſo varied by every change in the centre of motion. Where bones are connected by large ſurfaces, the centre of motion frequently ſhifts from one part to another; but in general it approaches towards that aſpect whither the bone is moving at the time; and as it advances, the muſcles recede, to increaſe their force.

a. The lever of reſiſtance, as well as of the power, is varied by the ſeveral changes of poſition; is ſometimes ſhortened at the time that the lever of the power is lengthened; and *vice verſa*.

If

(E) The terms *peripheral* and *central*, are employed by Dr Barclay, to denote the aſpects of any organ, according as they reſpect the *circumference* or the *centre* of the organ; and when the termination of theſe words is changed from *l* into *d*, they denote, like the other terms of his nomenclature, the direction in which the action of theſe parts is exerted. See Barclay's Anatomical Nomenclature.

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If AB (fig. 9.) repreſent the radius, BC the humerus, DE the biceps flexor muſcle, and R the reſiſtance hung to the diſtal extremity of the radius, it will be evident that, when BA is, by the action of the flexor muſcle, brought into the poſition B*a*, the lever of reſiſtance will no longer be BA, but BH, equal to a perpendicular ſtraight line drawn from B, the centre of motion, to the line of reſiſtance; and, as the lever of reſiſtance has been ſhortened, the lever of the muſcle has been proportionably lengthened. Were the radius to reſume its former poſition, the reverſe of theſe circumſtances would take place.

b. Sometimes again, the lever of the power and of the reſiſtance are lengthened or ſhortened at the ſame time.

Let AB (fig. 10.) repreſent the tibia, BC the femur, and DEF the crureus muſcle; and that the femur, with the weight of the body, is to be raiſed to the ſituation B*c*; the centre of motion will, during extenſion, approach towards the muſcle at the rotular aſpect, while the plane of reſiſtance, as is evident from the figure, will be approaching to the centre of motion.

c. In the changes of attitude, while a bone is turning on its centre of motion, the centre itſelf is often at the ſame time deſcribing, either the ſegment of a circle, or a line compoſed of circular ſegments.

Let AB (fig. 11.) repreſent the foot, BC the *tibia*, CD the thigh bone, and DE the trunk; and let us ſuppoſe that it is required to bring the three laſt, by the action of their muſcles, to the perpendicular BF, ſo that BC ſhall occupy the ſituation of BG, CD the ſituation of GI, and DE the ſituation of IF; the point C on the centre B will move in the ſegment CG, and as C is changing its poſition in CG, the point D, which moves round the point C as its centre, will, if the extenſions be regularly performed in the ſame time, deſcribe ſuch a curve as DI; for as the point D muſt neceſſarily move atlantad and ſternad, (F) in order to preſerve the centre of gravity, the general direction of its courſe muſt be known; and if CG be divided into equal parts, and at each of the diviſions a circle deſcribed with the radius CD, the points in DI correſponding in number with the points in CG, and at equal diſtances in the ſternal direction, will each be found in the circumference of one of the circles deſcribed ſucceſſively round the point C as it paſſes along the ſegment CG.

In like manner, if the extenſions of CD and DE be regularly performed in the ſame time, the point E will deſcribe ſuch a curve as EF, the points in EF being in the circumferences of the ſeveral circles ſucceſſively deſcribed round the point D as it moves along the curve DI.

12. When we examine the ſtructure of the animal ſyſtem, we ſhall generally find that the motions of the bones, as produced by the muſcles, are the combined effects of different forces, and hence that a ſmall number of muſcles is enabled to produce, with ſteadineſs and accuracy, an almoſt infinite variety of changes *.

For more on the general ſubject of muſcular action, and for an account of the principal motions of the human body, we muſt refer to Dr Barclay's publication.

* Barclay on *Muſcular Motion*, Part ii. chap. 3.

One of the moſt intereſting enquiries reſpecting animal motion, is that of the progreſſion of different animals, or of the powers of loco-motion.

131 Progreſſive motions.

Thoſe animals which poſſeſs the faculty of changing their place, exerciſe this faculty by very different organs. Some can only creep, as worms, and many molluſca; others can only ſwim, as all fiſhes, many of the molluſca, and ſome of the teſtacea. Moſt birds can both fly, walk, and run, while a few do not poſſeſs the power of exerciſing the firſt of theſe motions. All the mammalia, and moſt reptiles, properly ſo called, can walk, run, climb, leap, and perform a variety of other motions; and a few of the former claſs can imitate the flying of birds. We ſhall briefly examine the mechaniſm of theſe different actions, but by way of introduction, we ſhall firſt conſider how the action of ſtanding is performed.

132 Standing.

Standing, in moſt animals, is ſolely the effect of the continued action of the extenſor muſcles of all the joints, as is evident from the circumſtance, that if an animal, while ſtanding, ſuddenly dies, or in conſequence of ſome powerful cauſe, as a ſtrong electric ſhock, ceaſes to make the neceſſary efforts for preſerving the upright poſition, all the articulations of the legs yield to the weight of the body, and bend under it. In ſome animals, however, the extenſion of the muſcles is ſo much aſſiſted by powerful ligaments attached to the articulations of the legs, that they are enabled to continue ſtanding for a much longer time, and with much leſs fatigue than moſt others. This is the caſe with birds that perch, and it is particularly remarkable in the ſtork, which by means of this peculiar mechaniſm is able to ſtand on one foot for ſeveral days together.

The action of ſtanding is ſomewhat different, according as the animal ſtands on two feet or on four.

133 Standing on two feet.

That a body may be ſupported in a vertical poſition, it is neceſſary that it be ſo diſpoſed as to be in a ſtate of equilibrium, or that it be ſo balanced that a perpendicular line from the centre of gravity ſhall fall within its baſe. See Mechanics, N° 193, et ſeq. It is evident that the more extenſive the baſe is on which the body ſtands, the leſs is the danger of its loſing its balance. Man can very eaſily preſerve himſelf in the vertical poſition, from the broad baſis formed by his feet, and from the great power he poſſeſſes of ſeparating theſe to a conſiderable diſtance. This latter depends chiefly on the greater weight of his pelvis, and the length and obliquity of the neck of the thigh bone, by which this bone is carried more outward, and removed farther in its articulation, than in any other animal. In man, too, the foot is peculiarly adapted to ſtand firmly on the ground, from the flatneſs of its inferior ſurface, and from having the heel bone ſo formed as to come in perfect contact with the ground. The muſcles that move the foot are alſo very advantageouſly inſerted, and the extenſor muſcles of the heel are proportionably thicker than in moſt of the mammalia.

The thigh of man, when in the erect poſture, is in a ſtraight line with the trunk and the leg, whereas in quadrupeds, it is ſituated cloſe upon the flank, and forms an acute angle with the ſpine. On this account, the thigh bone of quadrupeds is flat, and proportionally weaker than that of man. The extenſor muſcles of the thigh are proportionally ſtronger in man than in the other animals; and as the thigh bone moves upon the pelvis in every direction, theſe extenſors are in man ſo conſiderable, that he is the only animal that poſſeſſes what are properly called hips.

In conſequence of this ſtructure, the human ſacral extremities are furniſhed with a ſufficient baſe, and form

Of Animal Motion. very folid bodies for fupporting the trunk. Man alfo poffeffes feveral advantages for maintaining the general equilibrium of the body, efpecially the facility with which he holds his head in the erect pofture, owing to the pofition of the occipital bone, and the horizontal direction of the eyes and mouth. See the article MAN, N° 5. and 6.

The quadrupeds that fometimes try to ftand on their hind feet only in order that they may either employ their fore feet in taking hold of fome object, or avoid keeping their head too low, feem rather to fit than to ftand. Their trunk refts at the fame time on their hind feet, as far as the heel, and on the buttocks; it is ftill neceffary, however, that their head and neck fhould be proportionally fmall, as in *monkeys, fquirrels, opoffums, &c.* otherwife the weight of thofe parts would be too great for the force employed in their elevation; but even when feated, the animal is generally obliged to reft on the fore feet, as may be obferved in *dogs, cats, &c.*

Some quadrupeds ufe their tail as a third foot, to enlarge the bafe of the body: and when it is ftrong, it is capable of contributing to their fupport for fome time. We find examples of this in the *kangaroos* and *jerboas*.

We have already noticed the mechanifm in the feet of birds, which enables thefe animals to fupport themfelves on two legs, though they do not ftand in a vertical pofition, and though the atlantal part of their bodies is advanced more beyond the centre of gravity than the facral part. Other advantages poffeffed by birds in this refpect are, the great flection of the thigh bone and tarfus; the length of the anterior toes, and the length and flexibility of the neck.

134 Standing on four feet. An animal which ftands on four feet is fupported on a very confiderable bafe; but from the great weight of the head and neck in thefe animals, their centre of gravity is nearer to the atlantal than to the facral extremities (F). It is evident from this, that in quadrupeds, the former muft fuftain almoft the whole weight of the body; and we find, accordingly, that they are furnifhed with very ftrong mufcles. In fhort, all that the facral extremities feem to want in mufcular force, appears to be transferred to the atlantal.

As in moft quadrupeds the head inclines towards the horizon, and the neck is often very long, very powerful means are required to fuftain the former. Thefe means are furnifhed by the great fize, and extenfive attachments of the mufcles of the neck, and efpecially in many quadrupeds by the cervical ligament. In the *mole*, which employs its head to raife confiderable burdens of earth, the cervical mufcles are peculiarly ftrong, and the ligament is converted into bone.

The body of a quadruped hangs between the four legs, and by its weight tends to draw the fpine downwards. This is counteracted by the abdominal mufcles, efpecially by the ftraight mufcles, which produce a curvature in the oppofite direction. The abdominal mufcles act with peculiar force in arching the fpine upwards in thofe mammalia that are covered with fcales or fpines, and are accuftomed to roll themfelves upon the approach of danger, as the *hedgehog*, the *armadillos*, and the *pangolins*.

Oviparous quadrupeds or reptiles, have their thighs directed outward, and the inflections of the limbs take place in planes that are perpendicular to the fpine. In thefe, therefore, the weight of the body muft act with a much longer lever, in oppofing the extenfion of the knee-joints; and accordingly they have the knees always bent, and the belly dragging on the ground between their legs, whence the name of *reptiles*.

135 Walking. In walking on a fixed furface, the centre of gravity is alternately moved by one part of the extremities, and fuftained by the other, the body never being at any time completely fufpended over the ground.

136 Walking on two feet. Animals which can ftand erect on two legs, fuch as man and birds, walk alfo on two legs. But feveral quadrupeds that cannot ftand on two feet but with great difficulty, may yet move in that pofture for fome time with fufficient eafe. This arifes from its being in general lefs painful to walk than to ftand, the fame mufcles not being continued fo long in action. And alfo it is lefs difficult to correct the unfteady motions by contrary and alternate vacillations (a thing eafy in walking), than it is to prevent them altogether.

When man intends to walk on even ground, he firft advances one foot; his body then refts equally on both legs, the advanced leg making an obtufe angle with the tarfus, and the other an acute one. The ground not yielding to the point of the foot, the heel and the reft of the leg muft of neceffity be raifed, otherwife the heel could not be extended. The pelvis and trunk are confequently thrown upward, forward, and fomewhat in a lateral direction. In this manner they move round the fixed foot as a centre, with a radius confifting of a leg belonging to that foot, which, during this operation, continually diminifhes the angle formed with the tarfus. The leg which communicated this impulfe is then thrown forward, and refts its foot upon the ground; while the other, which now forms an acute angle with its foot, has the heel extended in its turn, and in like manner makes the pelvis and trunk turn round upon the former leg.

As each leg fupports the body in its turn, as in ftanding on one foot, the extenfor mufcles of the thigh and knee are brought into action, to prevent thefe articulalations from yielding; and the flexors act immediately after, when the leg having thrown the weight of the body on its fellow muft be raifed before it can again be carried forward. As the undulatory motion that neceffarily attends a man's walking, cannot be perfectly regulated on both fides, he cannot walk in a perfect ftraight line, nor can he walk in a direct courfe with his eyes fhut.

In walking down an inclined plane, or defcending a ftaircafe, as the advanced leg is placed lower than that which remains behind, the extenfors of the leg muft act more powerfully to prevent the body from falling backwards. Again, on afcending fuch fituations it is requirfite at each ftep, not only to tranfport the body horizontally,

(F) Thefe terms fignify the fame as *fuperior* and *inferior* in man, *anterior* and *pofterior* in quadrupeds; but are more convenient, as applying indifcriminately to both. *Atlantal* denotes what is next the *atlas*; *facral* what is next the *facrum*. See *Barclay's Nomenclature*.

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zontally, as on walking on level ground, but to bear it up against its own weight, by means of the extensors of the knee of the advanced leg, and those of the heel of that which is behind; this is the reason of the knee and calf of the leg being fatigued in ascending; and the fatigue is relieved by inclining the body forward, because ... the lever by which its weight acts on the knee is ...ened.

Running is only a succession of short leaps, and it will be understood from what we shall presently say of leaping.

137 Walking on four feet.

When a quadruped walks, he first slightly bends the articulations of the hind legs, and then extends them, in order to carry forward the body, which motion is considerably aided by the extensors of the knee and the heel. The breast being thus thrown forward, the fore legs incline backward, and the animal would fall, did it not instantly throw them forward in order to support itself. It then draws up the trunk upon the fore legs, and renews its former efforts.

In this walking, each step is performed by two legs, one belonging to the fore, and the other to the hind pair. Sometimes these are of the same side, and sometimes those of opposite sides. The motion of a horse who steps forward in the latter way, is termed a pace.

In the animals that have the fore feet longer than the hind, and have their strength chiefly in the anterior part of the body, the principal impulse is given by extending the fore foot. The hind foot then rises to follow it, and it is not until the moment that the latter extends itself in its turn, that the fore foot is raised. This is the manner in which the *giraffe* is said to move.

But when the fore legs are considerably disproportioned to the others, and particularly when the posterior extremities are feebly and badly articulated, as in the sloths, the animal is obliged to drag itself forward, by first extending the fore legs, and then bending them so as to draw the body after them. Hence the progression of the sloth is so laborious.

Those animals which have their fore legs very short in proportion to their hind legs, would be incapable of sufficiently supporting their bodies, and must fall forward on each impulse of the latter, had they not the precaution to make a prancing movement; that is, to raise the anterior extremities entirely off the ground, previously to their being impelled onward by means of the hind feet. Accordingly, such animals cannot in propriety of language be said to walk; they only move forward by leaps. This is the case with hares, rats, and particularly jerboas. Indeed, these animals cannot be said to walk at all, except in the action of ascending. When they attempt to walk slowly on level ground, they are obliged to move themselves by the fore feet, and merely to drag after them the hind pair. This may be observed in rabbits, and still more distinctly in frogs.

138 Leaping.

In leaping, the body rises completely from the earth, and remains without any support for a short period, the duration of which depends on the force with which the leap has been made. This action is performed by a sudden extension of all the muscles belonging to the sacral articulations, immediately after they have undergone an unusual degree of flection. By this general extension these articulations receive a violent motion, the impulse of which is communicated to the centre of gravity of the body, and it is thus projected with a determined velocity, which is more or less in opposition to its weight. The projectile force and extent of the leap depend on the proportional length of the bones, and strength of the muscles. Those animals, therefore, leap best that have the sacral extremities longer and thicker than the atlantal; as the *kangaroos*, *jerboas*, *frogs*, *alticæ*, *grylli*, *fleas*, &c.

Small animals leap proportionally much farther than the larger species; and we know of none whose muscular strength, in this way, can be put in competition with that of a flea, which in a moderate computation is known to leap to a distance of at least 200 times its own length. The direction of a leap depends on the situation of the centre of gravity with respect to the member by which the impulse is given. Hence, only man and birds can leap vertically, because they alone have the trunk situated above the members by which the leap is effected. Quadrupeds, and most insects, can only leap forward; but spiders, which have several long feet on each side of their body, can also leap sideways.

139 Running.

Running consists of a series of low leaps performed alternately by each leg. It differs from walking, in the body being projected forward at each step, and in the hind foot being raised before the anterior touches the ground. It is more rapid than the quickest walk, because the acquired velocity is preserved, and increased at each bound by a new velocity. Running, therefore, cannot be instantaneously suspended, though a stop may be put to walking at each step.

In running, the animal inclines its body forward, that the centre of gravity may be in a proper position for receiving an impulse in that direction from the hind leg; and it is obliged to move the fore leg rapidly forward, to guard against falling.

Man varies his manner of running, only by taking longer or shorter steps, or giving to this motion a greater or less degree of rapidity; but quadrupeds vary this motion by the different order in which they raise each foot, or bring it to the ground.

140 Trotting.

Trotting is a mode of running in which the feet diagonally opposite rise at once, and fall at once, each pair alternately, but in such a manner, that for a moment all the four feet are off the ground. This produces a regular motion, and the sound of the animal's steps are heard two and two in succession.

141 Galloping.

Galloping is a running motion in which the animal raises the anterior feet at each step, and throws the body forward by the extension of the posterior feet. When the two fore-feet descend at the same time, and are followed by the two hind feet also descending together, the motion is called a *full gallop*, which is the most rapid a *horse* can perform, and the only mode of running in *dogs*, *hares*, &c. In this kind of gallop the steps of the horse are likewise heard by two beats at a time. The *common gallop* is when the two fore-feet are lifted unequally, and fall one after another. This may be divided into *gallops* in which the horses footsteps are heard by a series of three or four beats, because the posterior feet may fall to the ground either both together, or one after the other.

There are several kinds of animals which leap by the means of organs different from feet, but always by a sudden extension of several articulations.

Serpents leap by folding their bodies into several undulations,

dulations, which they unbend all at once, according as they wish to give more or less velocity to their motion; some may be assisted by the scales of their belly, which they can elevate and depress, but only a few genera are capable of employing this means.

Some fishes also leap to the tops of cataracts by bending their bodies strongly, and afterwards unbending them with an elastic spring.

The long-tailed *cray-fishes*, particularly the *shrimps*, leap by extending the tail after it has been previously bent under the body.

The larva of the *fly*, vulgarly called the maggot, forms itself into a circle, contracts itself as much as possible, then suddenly unbending, darts forward to a considerable distance.

142 Climbing. The motion of climbing, so useful to many of the inferior animals, consists, in hanging from, and strongly grasping any object susceptible of being seized by the fingers, toes, or tail, and thus rising, by successive efforts, in a direction opposite to the animal's weight. From this explanation, it is evident that those animals which have the divisions of their extremities most distinct and flexible, will be the best climbers; and accordingly we find that the animals called *quadrumanous*, as the apes, lemurs, and a few others, perform this action in the most perfect manner. Man is but an indifferent climber, as he can only grasp with his hands. In *oppossums*, *ant-eaters*, and *sloths*, one of the toes is distinct, like the thumb in man, apes, and lemurs; or else they have a considerable protuberance on the heel, which has the same effect. Many animals, as some of the *monkeys*, some species of *oppossum* and *ant-eater*, the *mantis*, &c. have a very flexible prehensile tail, which assists them in climbing. The animals of the cat genus have very sharp talons, by which they are materially assisted in this kind of progression, as they enable them to adhere firmly to the bark of trees, &c. Creepers, nut-hatches, woodpeckers, and other climbing birds, support themselves in a similar manner.

143 Flying. The motion of flying, by which an animal can support itself for some considerable time in the air, can properly be said to be performed only by birds: for though bats can imitate this motion with tolerable success, and the galiopithecus, flying-squirrels, and flying-oppossums, appear to fly from one tree to another, the motion of the former cannot be supported for so long a time as that of birds; and the motion of the latter animals can be considered only as a leap, assisted and prolonged by the opposition given to the air, by the membranous expansion between their limbs.

When a bird designs to fly, it first darts into the air, either by leaping from the ground, or by throwing itself from some height. In the mean time it raises the whole of the wings which had till then remained folded, and which it unfolds in a horizontal direction by extending the bones. When the wings have thus acquired all the superficial extent of which they are susceptible, they are suddenly depressed, till they form, with the vertical plane of the body, an angle that is obtuse upward, and acute downward. The resistance which the air gives to this motion suddenly performed in it, produces a reaction on the body of the bird, and thus moves it forward as in ordinary leaps. This impulse once given, the bird refolds the wings by bending the joints, and repeats its efforts by another stroke. As the velocity thus acquired in ascending is gradually diminished by the effect of gravitation, a moment occurs in which it ceases, and in which the bird tends neither to ascend nor descend. If at this moment it gives a new stroke with the wings, it acquires a new ascending velocity by which it will be carried as far as before, and by repeating these efforts, it will ascend in a uniform manner. If this second stroke be made before the velocity first acquired is lost, an additional impulse will be received; and by a continuance of this action the bird will ascend with an accelerated motion. If the wings do not vibrate when the ascending velocity is lost, the bird will begin to descend; and if it allow itself to fall down to the point from which it set out, it cannot ascend as high as at first, but by a much stronger exertion of the wings; but if it seizes in the fall a point so situated that the acquired descending velocity, and the small space which it has to fall down reciprocally balance each other, it may, by a series of equal vibrations, keep itself at the same height.

When a bird wishes to descend rapidly, as when it darts upon its prey, it altogether suppresses the vibration of its wings, and thus falls by its own gravity. While descending, however, it may suddenly break its fall by extending its wings, and this suspension is called a *recover*.

We have as yet considered only the vertical flight of a bird. To fly horizontally, it must rise in an oblique direction, and make a new movement of its wings, when it is ready to descend below the point from which it departed; but in this way it will not fly in a straight line, but will describe a series of curves so very much depressed, that the horizontal will overcome the vertical motion. In order to ascend obliquely, the bird must make quicker vibrations of its wings, and to ascend in a similar direction, the vibrations must be slower.

The deviations of flight to the right or left are chiefly produced by the unequal vibrations of the opposite wing; those of the left wing carrying the bird to the right, and *vice versa*. The more rapid the flight is forward, the greater is the difficulty of one wing surpassing the other in the velocity of its vibrations, and of course the deviation sideways is the more difficult. Hence birds which fly with the greatest velocity make large circles in turning.

The tail, when spread out, contributes to sustain the posterior part of the body. If it is depressed when the bird has acquired a progressive velocity, it presents an obstacle which elevates the posterior part of the body, and depresses the anterior. If it is turned up, the contrary effect is produced. Some birds incline to one side, to assist them like a rudder, when they wish to change their horizontal direction.

The structure of most birds peculiarly adapts them for rapid motion through the air, and for sustaining themselves in this element with the greatest facility. See ORNITHOLOGY, N° 37.

The action of swimming, like that of flying, nearly resembles leaping, except that, like flying, the leap does not take place on a fixed surface. A great variety of animals, besides fish, and most of the other inhabitants of the waters, are capable of swimming. This action is performed with considerable ease by several of the mammalia, 144 Swimming.

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malia, even by the bulky elephant, and the unwieldly hippopotamus; by many tribes of birds; by feveral reptiles and ferpents, and by fome infects.

The organs employed by fifhes, in making their way through the water, are their fins, tail, and air-bladder; the two former exerting the neceffary motions like the [feet of] birds, while the latter, by being compreffed or [ex]panded, caufes the neceffary changes in the fpecific gravity of the body, and thereby renders the animal more or lefs buoyant. The fwimming of fifhes has been treated of with fufficient minutenefs under ICHTHYOLOGY, chap. iii. fect. 3. to which we refer the reader.

The cetacea employ much the fame means as fifhes; but in them the principal efforts of the tail are made in a vertical direction, and the ufe of the air-bag is fupplied by lungs, which they can comprefs and dilate at pleafure, by the action of the diaphragm, or the intercoftal mufcles. See CETOLOGY.

The fwimming of mammalia, and of water birds, is performed by means of the legs and feet, which are ufed like oars, to propel the body forward by the refiftance which they make to the water in the contrary direction. Hence thofe quadrupeds and birds that have flat or webbed feet, fwim moft eafily, as the refifting furface is the greateft. Of all the mammalia, man has the moft occafion to ufe his hands in fwimming, on account of the greater proportional weight of his head.

Serpents, and the larvæ of fuch infects as fometimes inhabit the waters, perform the action of fwimming by rapid inflections of the body like an eel or a leech. The larvæ that are moft commonly found in the waters are thofe of the water *beetles*, the *hydrophilus*, the *day flies*, the *aquatic tipulæ*, and *gnats*.

145 No animal walks without legs, or flies without wings (if we except the flying fifh, whofe fins enable it rather to fpring than fly); but there are many that fwim without fins, and that leap and creep without any legs. The rapidity of movement is not proportioned to the number of inftruments that are employed: if the fpout-fifh be obferved to move flowly with one leg, the fea-urchin moves ftill more flowly with many thoufands; the oyfter moves by fquirting out water; the fcallop by the jerk of its fhell, and when in the water it rifes to the furface and fails before the wind.

Many animals are formed by nature to fly, walk, leap, and fwim: the fate of thofe is rather uncommon whofe mufcles or feet are by nature attached to their integuments; the lobfter is obliged to throw off its fhell, and the caterpillar all its feet, with the fkins, and in that fituation to remain ftationary till it receive new inftruments of motion.

146 Whoever has read the celebrated work *De Motu Animalium*, needs not to be told that, befides the organs which are here mentioned, the form, the ftructure, and even the fpecific gravity of the body, as depending on the nature of the bones and mufcles, or as varied by air-veficles and bubbles, with a great variety of other circumftances, are neceffary to explain the different phenomena of locomotion.

147 Vegetable motions.

As to vegetable motions, they evidently depend on external agents: the wings of feeds only fit them to be carried by the wind, their fpecific gravity to float in the water, and their legs or tentacula to adhere to bodies that are in motion; the fingular motions which have been afcribed to fleeping, to waking, to fenfation, and volition, in the vegetable kingdom, feem only the confequence of light, heat, moifture, and fuch ftimulants, acting invifibly or with fecret influence: the opening and clofing of the meteoric flowers are always correfpondent to the ftates of the atmofphere; and the opening and clofing of the equinoctial and tropic flowers, to the light, the length or fhortnefs of the day.

148 Ufes of locomotion.

The principal intentions of locomotion are to get food, to fhun danger, to promote intercourfe and difperfe the fpecies.

There is perhaps no part of phyfiology which is more important than the relations which fubfift between the different functions of the living body; but it is a part of the fubject which is as yet but little underftood. We regret that our limits will not permit us to pay all the attention to it which we could wifh. We fhall, however, briefly notice under each function, the principal relations that are found to take place between it and thofe which have been previoufly confidered.

149 Mutual relations between fenfation and motion.

Befides the dependence which animal motion has, in moft inftances, on the nervous fyftem, (fee N° 111.) we find an evident fympathy between thefe two functions in a variety of phenomena. A violent emotion or impreffion on the nerves often throws the limbs into convulfive agitations; fpafmodic affections are relieved, or fometimes removed, by the coming on of delirium; and thefe fymptions will alternate with each other: a compreffion of the brain, or of fome large nervous trunk, produces general or partial want of motion, and when this compreffion is removed, the mufcles for the moft part recover their ufual action; an attack of epilepfy is often preceded by the fenfation of a ftream of vapour commencing in fome external part, and rifing to the brain. Thefe, and many other phenomena that might be mentioned, fully prove the fympathy between the nervous and mufcular fyftems; and with this enumeration we muft difmifs the fubject.

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150 Appetite for food.

THE neceffity of repairing the wafte of the body is announced in all animals by the feelings of hunger and thirft; the former of which intimates the occafion for folid, the latter for liquid food. This imperious neceffity overrules all the other affections of the vital principle, and every other appetite often remains fufpended till that neceffity be fatisfied. It is difficult to affign the final caufe of thefe fingular fenfations, but probably our refearches on that fubject are rather curious than ufeful. Whatever be the ultimate end of thefe appetites, we readily perceive how much they are influenced by habit. We find that when we are accuftomed to take food at particular times, the appetite, under ordinary circumftances, always reminds us at thefe times, of the occafion, whether real or apparent, for receiving a new fupply. By this influence of habit fome animals, efpecially man, are accuftomed to take feveral meals in a day, while others can faft for days, or even weeks, together. The appetite for food alfo varies confiderably at different ages. It is more lively and more imperious in infancy and early childhood, and in general in thofe animals who have not yet acquired their full growth; it is on the contrary weaker in advanced age, and when the body ceafes to increafe

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increaſe in ſize. It is more frequently renewed in the ſtrong and healthy, and thoſe who are accuſtomed to laborious occupations or active exerciſes.

151 We know that in the natural ſtate of the animal body, the appetite for food is influenced by the nature of the aliment on which the animal is accuſtomed to ſubſiſt. Many animals live entirely on vegetable food, and theſe have no appetite for animal ſubſtances, and even reject theſe when offered to them. On the other hand, many tribes live entirely on animal food, and either refuſe vegetable, or, if obliged by neceſſity to employ it as food, do not appear to derive nouriſhment from it. We find, however, that it is in the power of habit to remove theſe appetites; that a horſe or a ſheep may be taught to live on animal food, while a dog or a cat may be ſupported entirely on vegetable ſubſtances. A few animals are capable of ſubſiſting on almoſt every kind of animal or vegetable ſubſtances, or are omnivorous.

152 Plants and ſome animals live on water and air alone.

Many animals are capable of being ſupported by water and air alone. We know that ſeveral fiſhes, as the minow, the gold and ſilver fiſh, &c. will live for a long time in a veſſel containing pure water, and freely expoſed to the air. Rondelet (a celebrated writer on fiſhes in the 16th century) relates a remarkable inſtance of this. He kept a fiſh during three years in a veſſel that was conſtantly full of very pure water. It grew to ſuch a ſize, that at the end of that time the veſſel could no longer contain it. Leeches are often kept for ſeveral years with no other nutriment but water, and that not very often changed. There is good reaſon to believe that the ſole food of plants conſiſts of water and air, and that the ſoil in which they grow anſwers ſcarcely any other purpoſe than that of preſerving and conducting thoſe neceſſary aliments.

153 It has been ſuppoſed that ſome animals are capable of ſubſiſting on matters that appear to contain no nutritious principles, ſuch as ſand, hair, and wool. Borelli long ago conceived this opinion, from obſerving that in many teſtaceous animals which he diſſected, the alimentary tube contained nothing but ſand. It has often been remarked, that horſes, cows, and ſheep, when deprived of their uſual nouriſhment, will lick their bodies, and ſwallow down the hair, or, in the caſe of ſheep, will tear off and ſwallow each others wool. If we conſider the nature of theſe ſubſtances, we think there is no reaſon to ſuppoſe that they anſwer any other purpoſe than diſtending the alimentary canal or ſtomach, and thus in ſome meaſure counteracting the effect of hunger.

The ſubject of food in general has been already treated of, under ALIMENT, and in MATERIA MEDICA, Part I. N° 17; and the function of digeſtion, as far as it relates to man, has been conſidered under ANATOMY, N° 106, 107, and under CHEMISTRY, N° 2548. It remains for us here only to make a few obſervations on the comparative phyſiology of this function.

154 Differences of digeſtion.

Digeſtion differs conſiderably in the various claſſes of animals, both as to the organs by which it is performed, and as to the ſimplicity or complex nature of the operation itſelf. The general variations that take place in the organs of digeſtion, have been mentioned under the comparative part of ANATOMY, N° 152, and are fully treated of by Cuvier, in his *Leçons d'Anatomie Comparée*, tom iii. and Blumbenbach, in his *Comparative Anatomy*, chap. 6. and 7.

In the more perfect animals, digeſtion ſuppoſes a ſeries of operations, from the time that the food enters the mouth, till the nutritious parts of it are taken into the circulating ſyſtem. Theſe operations are, *maſtication*, *inſalivation*, *deglutition*, *chymification*, and *chylification*.

155 *Maſtication* is performed by means of teeth, and therefore can ſcarcely be ſaid to take place in thoſe an[imals] that are not furniſhed with theſe organs. W[e] know [that] all mammalia, except thoſe which Cuvier calls *edentata*, as the ant-eaters, pangolins, and platypus, have teeth, fitted both for dividing and chewing their food; but here an important difference takes place. Thoſe animals which live chiefly on animal food, have moſt of their teeth ſharp and pointed, for the purpoſe of ſeizing and tearing their prey, while the graminivorous and granivorous animals have very large and ſtrong grinders, in which the hard ſubſtance commonly called enamel (or what Blake calls *corpus ſtriatum*, *) forms alternate layers with the bony part. Such are alſo found in moſt reptiles and ſerpents, and in many fiſhes; but in ſome of theſe they ſeem leſs to ſerve the purpoſe of dividing the food, than to ſeize and retain it till ſwallowed. Birds have no teeth, though ſome of them have the mandibles of the bill ſo formed as to divide and cut in pieces their food.

* Blake on the Structure and Formation of the Teeth.

156 Inſalivation.

During maſtication the food is mixed with the ſaliva, and is thus better fitted for eaſy ſolution in the ſtomach. This inſalivation of the food may, however, take place, without previous maſtication. It is common for ſerpents to ſwallow their food whole; but in order to facilitate its paſſage down the throat, they firſt beſmear it all over with their mucous ſaliva. In many animals, a proceſs ſimilar to inſalivation takes place, while the food remains in the mouth. In ſeveral ſpecies of the ape tribe there is a pouch ſituated on each ſide of the jaw, and in theſe pouches the greater part of the food is retained, not merely as ſome ſuppoſe, to ſerve as a future meal, but to undergo a dilution by the fluids that are there ſecreted. In granivorous birds, the food is firſt received into a membranous bag, formed by a dilatation of the gullet, and commonly called the *crop*, where it is macerated by the fluids that are there ſeparated by means of glands or exhaling veſſels, and paſſes down, as the animal requires, to be further prepared by the ſtomach. The buſtard, indeed, though a granivorous bird, has no proper crop, but the gullet is furniſhed with numerous and large glands.

For an account of the chemical nature and properties of ſaliva, ſee CHEMISTRY, N° 2723.

157 Deglutition.

The operation of deglutition depends chiefly on the action of the tongue, and on that of the muſcles which ſurround the pharynx and gullet. It is more or leſs ſpeedy in proportion as theſe are more or leſs active and vigorous. Moſt animals, after having once ſwallowed their food, do not receive it again into the mouth; but this takes place in ſeveral tribes, and is called *rumination*, or chewing the *cud*.

158 Rumination.

Rumination takes place chiefly in thoſe animals that feed on herbage, and have not a muſcular ſtomach; ſuch as all the tribes that Linnæus has ranked under the order *pecora*. In theſe the food, after being ſlightly chewed, is received into the firſt ſtomach, and after remaining there for a ſhort time, it is gradually brought by a retrograde action of the gullet into the mouth, where it undergoes a complete trituration and inſalivation,

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tion, and is then conveyed into the 2d, 3d, and 4th ſtomachs, to be mixed with the gaſtric juice.

Some of thoſe birds which have a diluting ſac or ingluvies, ſeem likewiſe to ruminate. This in the parrot was obſerved by the gentlemen of the French academy. It has ſince been obſerved in rooks, macaws, cockatoos, and others: and Mr Hunter, to whom phyſiology is ſo much indebted, diſcovered that the male and the female pigeon ſecrete in their ingluvies a certain liquor for feeding their young; and that moſt kinds of what have been thought ruminating birds do very often in expreſſing their fondneſs regurgitate their food. Yet both this and another ſpecies of regurgitation which is very common with thoſe animals that ſwallow indigeſtible ſubſtances with their food, ſhould be carefully diſtinguiſhed from rumination. For a farther account of rumination, and of the digeſtive organs of ruminating animals, ſee *Comparative* ANATOMY, N° 228—234. and *Phil. Tranſ.* 1807, Part ii.

159 Chymification.

The food having entered the ſtomach, undergoes in that organ proceſſes that are partly mechanical, or rather organic, and partly chemical, depending on the ſtructure of the ſtomach, and the nature of the juices ſecreted into its cavity. By theſe actions it is reduced into a pulpy ſubſtance commonly called *chyme*.

160 Organic action of the ſtomach.

The organic action of the ſtomach is greater or leſs, according as this organ is more or leſs muſcular. There are many animals, chiefly birds of the granivorous tribes, that have a very muſcular ſtomach, commonly called *gizzard*, capable of grinding, not only the grains received into it, but even of reducing to powder ſmall pieces of glaſs, and of blunting the points of needles and lancets. Theſe facts were firſt proved by Borelli, who introduced into the gizzards of fowls, nuts, filberts, hollow ſpheres of glaſs, hollow cubes of lead, ſmall pyramids of wood, and ſeveral other ſubſtances, which he found were either cruſhed together, or broken to pieces. He computes the power exerted by the ſtomach of the Indian cock as equal to the preſſure of 1350 pounds weight. Theſe experiments were repeated and verified by Spallanzani.

Some animals that are not poſſeſſed of a muſcular ſtomach have, within that organ, teeth, or other hard bodies, for the purpoſe of breaking or grinding their food. This is the caſe with many of the cruſtacea, as crabs and lobſters.

A great many animals have what Spallanzani calls *intermediate* ſtomachs, i. e. not ſo muſcular as the gizzard of fowls, nor ſo membranous as the ſtomachs of ruminating animals; this is the caſe with many birds, as ravens, crows, herons, &c. The ſtomachs of theſe animals are poſſeſſed of conſiderable force, though this is not nearly equal to that exerted by the gizzard. Theſe animals poſſeſs the power of rejecting by the mouth the ſubſtances that are incapable of digeſtion in the ſtomach, every nine, or ſometimes every three hours.

The animals with membranous ſtomachs are very numerous, comprehending man, moſt beaſts and birds of prey; many reptiles, ſnakes, fiſh, &c. The ſtomachs of theſe animals are ſuſceptible of but little muſcular action, though in many ſpecies they both contract upon the food, and reject it through the gullet, on various occaſions. Birds of prey, like the ravens, crows, &c. poſſeſs the power of rejecting, in the form of pellets, the indigeſtible parts of their food, which uſually takes place every 24 hours.

161 Diſcoveries of Mr Home.

A moſt intereſting paper by Mr Everard Home is publiſhed in the Philoſophical Tranſactions for 1807, part ii. on the ſtructure and functions of the ſtomachs of various animals. We regret that we can here give little more than the reſults of his inquiries.

From previous inveſtigations reſpecting the ſtomachs of ruminating animals, Mr Home was led to believe that the fourth ſtomach in theſe tribes was either always, or during digeſtion, divided into two portions, each performing a different office in the digeſtive proceſs; and he even conjectured, that a ſimilar diviſion might take place in other animals.

Mr Home has examined the ſtomachs of a great variety of animals, and inveſtigated the progreſs of digeſtion in *ruminants*, the *hare* tribe, which occaſionally ruminate, the *beaver*, *dormouſe*, *water-rat*, *common rat*, *mouſe*, *horſe*, and *aſs*, *kangaroo*, *pecaré*, *hippopotamus*, *elephant*, the *cetacea*, *fowls*, and laſtly in *man*.

162 Human ſtomach the link between carnivorous and phytivorous ſtomachs.

The human ſtomach appears to be the uniting link between thoſe that are fitted only to digeſt vegetable ſubſtances, and thoſe of animals that are entirely carnivorous; and yet we find, that in its internal ſtructure it is in every material reſpect ſimilar both to thoſe of the monkey and ſquirrel, which uſually digeſt only vegetable food, and to thoſe of carnivorous animals.

163 Into a *cardiac* and *pyloric* portion.

The human ſtomach is occaſionally divided into a *cardiac* and a *pyloric* portion, by a muſcular contraction ſimilar to thoſe of other animals; and as this circumſtance has not before been noticed, it is proper to be more particular in deſcribing it.

The firſt inſtance in which Mr Home obſerved this muſcular contraction in the human ſtomach, was in a woman who died in conſequence of being burnt, and who had been unable to take much nouriſhment for ſeveral days before her death. The ſtomach was found empty, and was taken out of the body at a very early period after death. It was carefully inverted to expoſe its internal ſurface, and gently diſtended with air. The contraction was ſo permanent, that after the ſtomach had been kept in water, in an inverted ſtate, for ſeveral days, and at different times diſtended with air, the appearance was not altogether deſtroyed.

Since that time, Mr Home has taken every opportunity of examining the human ſtomach ſhortly after death; and he finds that this contraction, in a greater or leſs degree, is very generally met with. He is of opinion that this effect is not produced by a peculiar band of muſcular fibres, but that it ariſes from the muſcular coat, in the middle part of the ſtomach, being thrown into action to a greater or leſs extent according to circumſtances. When this part of the ſtomach is examined by diſſection, its muſcular fibres are not to be diſtinguiſhed from the reſt. If the body be examined ſo late as 24 hours after death, this appearance is rarely met with; a circumſtance which accounts for its not having before been particularly noticed.

164 Food firſt diſſolved in the cardiac portion;

That the food is diſſolved in the *cardiac* portion of the human ſtomach, is proved by this part only being found digeſted after death; the inſtances of which are ſufficiently numerous to require no addition being made to them. This could not take place unleſs the ſolvent liquor was depoſited there. Mr Hunter goes ſo far as

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to ſay in his paper on this ſubject, "there are few dead bodies in which the ſtomach at its great end is not in ſome degree digeſted."

165 But the chyle formed in the pyloric portion.

That the chyle is not formed there, and that it is commonly formed before the food paſſes through the *pylorus*, is proved by the reſult of ſome experiments made by Mr Hunter upon dogs, in the year 1760. The dogs were killed while digeſtion was going on; and in all, the food was leaſt diſſolved, or even mixed, towards the great end of the ſtomach, but became more and more ſo towards the *pylorus*, juſt within which it was mixed with a whitiſh fluid like cream.

166 Solvent liquor ſecreted by glands near the gullet.

From the reſult of theſe experiments, as well as from the analogy of other animals, it is reaſonable to believe, that the glands ſituated at the termination of the cuticular lining of the œſophagus, which are deſcribed by Mr Home, ſecrete the ſolvent liquor, which is occaſionally poured on the food, ſo as to be intimately mixed with it before it is removed from the cardiac portion; and the muſcular contraction retains it there, till this takes place.

167 Curvature of the ſtomach accounted for.

Such contraction being occaſionally required in the ſtomach, accounts for its being more or leſs bent upon itſelf, as by this ſtructure it is more readily divided into two portions, by the action of the muſcular fibres at that part where the angle is formed.

This contraction alſo explains why the contents of the ſtomach are not completely diſcharged from the firſt effect of an emetic; and by it Mr Home thinks we may explain the cramp of the ſtomach, and ſome kinds of indigeſtion.

168 Ornithorinchus the real link between quadrupeds and birds.

After comparing the ſtomachs of ſeveral carnivorous animals with that of man; in tracing the gradation from carnivorous beaſts through the bat tribe to birds of prey, Mr Home remarks that "the only real link between the ſtomachs of quadrupeds and birds is that of the ornithorinchus (or platypus), which, however, is more an approach to the gizzard, being lined with a cuticle containing ſand, and having the ſame relative ſituation to the œſophagus and duodenum. The food of this animal is not known; it is probably of both kinds; the papillæ at the pylorus, which appear to be the ſecretory ducts of glands, are peculiar to it.

169 General concluſions.

From the facts and obſervations brought forward in this valuable paper, Mr Home deduces the following general concluſions. "That the ſolvent liquor is ſecreted from glands of a ſomewhat ſimilar ſtructure in all animals, but much larger and more conſpicuous in ſome than in others.

"That theſe glands are always ſituated near the orifice of the cavity, the contents of which are expoſed to their ſecretion.

"That the viſcid ſubſtance found on the internal membrane of all the ſtomachs that were examined recently after death, is reduced to this ſtate by a ſecretion from the whole ſurface of the ſtomach, which coagulates albumen. This appears to be proved, by every part of the fourth cavity of the calf's ſtomach having the property of coagulating milk.

"This property in the general ſecretion of the ſtomach leads to an opinion, that the coagulation of fluid ſubſtances is neceſſary for their being acted on by the ſolvent liquor; and a practical obſervation of the late Mr Hunter, that weak ſtomachs can digeſt only ſolid food, is in confirmation of it.

"That in converting animal and vegetable ſubſtances into chyle, the food is firſt intimately mixed with the general ſecretions of the ſtomach, and after it has been acted on by them, the ſolvent liquor is poured upon it, by which the nutritious part is diſſolved. This ſolution is afterwards conveyed into the pyloric portion, where it is mixed with the ſecretions peculiar to that cavity, and converted into chyle.

"The great ſtrength of the muſcles of t[he] py[loric] portion of ſome ſtomachs will, by their acti[o]n, compre[ſs] the contents, and ſeparate the chyle from t[h]e indigeſtible part of the food.

"In animals whoſe food is eaſy of digeſtion, the ſtomach conſiſts of a cardiac and pyloric portion only; but in thoſe whoſe food is difficult of digeſtion, other parts are ſuperadded, in which it undergoes a preparation before it is ſubmitted to that proceſs."

170 Action of the gaſtric juice.

The action of the juices of the ſtomach, or of what we call the *gaſtric juice*, appears to have much more effect in the proceſs of chymification, than the muſcular action of the ſtomach, though the diſſolving power of this fluid ſeems to be proportionally leſs in thoſe animals that have the moſt muſcular ſtomachs. The gaſtric juice of granivorous birds is capable of diſſolving fleſh; but when this is entire, it requires four or five days for ſolution; whereas when bruiſed, half that time is ſufficient. Even grain is not diſſolved in it except when bruiſed. The gaſtric juice of animals with intermediate ſtomachs diſſolves fleſh and cartilage, but not bone. It is incapable of diſſolving entire ſeeds. In animals with membranous ſtomachs, the gaſtric juice is extremely active, and ſeems to be almoſt the only agent in the digeſtive proceſs. In ſome of theſe animals, however, as the ruminating tribes, this fluid has no effect on the food, unleſs it be bruiſed, or thoroughly maſticated. Spallanzani found, that owls digeſt fleſh and bones, but not grain;—that the gaſtric juice of the eagle diſſolves bread and bone, and even animal and vegetable matters, when it is taken out of the body;—that a wood pigeon may be gradually brought to live on fleſh;—that the owl and falcon do not digeſt bread;—that the gaſtric juice of the dog diſſolves even the enamel of the teeth.

Hence, in every order of animals, the gaſtric juice is the principal cauſe of digeſtion, and it agrees in all in many properties, and differs in others. In the frog, the newt, ſcaly fiſhes, and other cold-blooded animals, it produces digeſtion in a temperature nearly equal to that of the atmoſphere. In warm-blooded animals it is capable of diſſolving the aliment in a degree of heat lower than that of theſe animals. In them too the food is digeſted in a few hours, whereas in the oppoſite kind it requires ſeveral days, and even weeks, particularly in ſerpents; likewiſe, the gaſtric juice of the gallinaceous claſs can diſſolve only bodies of a ſoft and yielding texture, and previouſly triturated: whilſt in others, as ſerpents, the heron, birds of prey, and the dog, it decompoſes ſubſtances of great tenacity, as ligaments and tendons; and even of conſiderable hardneſs, as the moſt compact bone. Man belongs to this claſs, but his gaſtric juice ſeems to have no action on the hardeſt kinds of bones. Some ſpecies, likewiſe, are incapable of digeſting vegetables, as birds of prey; but man, the dog, cat, crows, &c. diſſolve the individuals of both kingdoms alike, and are omnivorous, and in general their gaſtric juices produce theſe effects out of the body.

For

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For an account of the chemical nature and properties of the gastric juice, see CHEMISTRY, N° 2551.

171 Solubility of foods. The process of chymification depends also, in a great measure, on the nature of the substances employed as food, as some of these are much more soluble than others. On this subject much information may be deduced by consulting the experiments of Dr Stark *, and [illegible] of [illegible]. Gosse of Geneva, an abstract of which is given in Johnson's Animal Chemistry, vol. i. p. [illegible]. From the latter experiments it appears, 1*st*, That the following substances are either insoluble, or are not digested in the usual time in the stomach.

Animal substances. 1. Tendinous parts. 2. Bones. 3. Oily or fatty parts. 4. Indurated white of egg.

Vegetable substances. 1. Oily or emulsive seeds. 2. Expressed oils of different nuts and kernels. 3. Dried grapes. 4. Rind of farinaceous substances. 5. Pods of beans and pease. 6. Skins of stone fruits. 7. Husks of fruits, with grains or seeds. 8. Capsules of fruit, with grains. 9. Ligneous stones of fruits. 10. The gastric juice does not destroy the life of some seeds; hence bitter-sweet, hemp, misletoe, and other plants which sometimes grow upon trees, are produced by the means of the excrements of birds, the kernels of seeds being defended from the menstruum by their exterior covering.

2*d*, That the following are partly soluble, viz.

Animal substances. 1. Pork dressed various ways. 2. Black puddings. 3. Fritters of eggs, fried eggs and bacon.

Vegetable Substances.—1. Salads of different kinds, rendered more so when dressed. 2. White of cabbage less soluble than red. 3. Beet, cardoons, onions, and leeks. 4. Root of scurvy-grass, red and yellow carrots, succory, are more insoluble in the form of salad than any other way. 5. Pulp of fruit with acids, when not fluid. 6. Warm bread and sweet pastry, from their producing acidity. 7. Fresh and dry figs. By frying all these substances in butter or oil they become still less soluble. If they are not dissolved in the stomach, they are, however, in the course of their passage through the intestines.

3*d*, That the following are soluble, or easy of digestion, being generally reduced to chyme in an hour, or an hour and a half.

Animal Substances.—1. Veal, lamb, and in general the flesh of young animals, are sooner dissolved than that of old. 2. Fresh eggs. 3. Cows milk. 4. Perch boiled with a little salt and parsley. When fried or seasoned with oil, wine, and white sauce, it is not so soluble.

Vegetable Substances.—1. Herbs, as spinach, mixed with sorrel, are less soluble. Celery. Tops of asparagus, hops, and the ornithogalus of the Pyrenees. 2. Bottom of artichokes. 3. Boiled pulp of fruits, seasoned with sugar. 4. Pulp or meal of farinaceous seeds. 5. Different sorts of wheaten bread, without butter, the second day after baking; the crust more so than the crumb. Salted bread of Geneva more so than that of Paris without salt; brown bread in proportion as it contains more bran is less soluble. 6. Rapes, turnips, potatoes, parsnips, not too old. 7. Gum arabic, but its acid is soon felt. The Arabians use it as food.

The solvent power of the gastric juice is increased by various stimulants, especially by those called *condiments*, as sea salt, spices, mustard, vinegar, as well as by vinous and spirituous liquors and old cheese in small quantities, and by various bitters. It is retarded by large quantities of diluting liquors, especially when taken hot; by acids and astringents taken a short time after eating; by unctuous substances; by mental employment, or severe bodily exercise, too soon after a meal; and by leaning with the breast against a table.

172 Various theories of digestion. It may be proper here to notice the various opinions that have been entertained respecting the immediate cause of digestion. The principal of these opinions are, that it is produced by coction or heat; by trituration in the stomach; by fermentation, or by putrefaction.

173 Heat. That it is not brought about by heat alone, will appear from the circumstance, that many cold-blooded animals digest their food as completely, though not so expeditiously, as warm-blooded animals.

174 Trituration. That it is not effected by trituration in the stomach alone, is evident from the experiments that have been made by Spallanzani, Stevens, and others, of giving to animals food enclosed in hollow perforated balls, sufficiently strong to resist the muscular power of the stomach; as the balls have been found empty, and not compressed.

175 Fermentation. That it is not owing to fermentation is proved by the circumstance, that the more perfectly digestion proceeds, the less is the evolution of gases in the stomach; the contrary of which would be the case, if digestion consisted in a fermentation of the aliment.

176 Putridity. That it does not depend on putridity, is evidenced by the observations that have been made on putrid food given to dogs, and examined some time after, when it was found perfectly sweet.

On the whole it appears, that in most animals the digestion of food in the stomach depends partly on a due degree of heat, partly on the vital action of the stomach, but chiefly on the action of the gastric juice.

177 Chylification. When the aliments have been converted in the stomach to the crude pulp called *chyme*, they are gradually propelled through the *pylorus* into the duodenum, where they are mixed with the bile, the pancreatic juice, and the fluids that are separated by the mucous coat of that intestine, and are thus reduced to a still finer pulp, containing, as one of its principal ingredients, the nutritious fluid called *chyle*, the nature and properties of which, as they have been but slightly mentioned in the former parts of this work, fall to be noticed here.

178 Properties of chyle. The properties of chyle have not been minutely investigated; but according to Fordyce, as far as experiment has been carried, the chyle of quadrupeds is so similar to that of man, and of each other, as hardly to be distinguished, even in tribes the most opposite to each other in their structure, food, and habits of life. As far as we can perceive, the chyle of a dog or a wolf differs in nothing from that of a sheep or an ox.

The chyle consists of three parts; one part which is fluid, and contained in the lacteals, but coagulates on extravasation.

The second part consists of a fluid, which is coagulable by heat, and in all its properties hitherto observed, it is similar to the serum of the blood.

The third part consists of globules, which render the whole white and opake. These globules have been supposed by many to be an expressed oil; but this has not been proved. Neither has it been perfectly demonstrated that sugar is contained in the chyle, although it has been

Of Digeftion. been made very probable. The difficulty of determining thefe points arifes from the fmall quantity that can be collected, the largeft animals not fupplying more than one ounce or two, at the moft. However, the part coagulating on extravafation; the part agreeing with ferum in its qualities; the globular part, which in fome animals, but not in quadrupeds, exifts without giving whitenefs to the chyle—alone, or along with fugar, form the effential parts of the chyle *.

179 Progrefs of the chyle. The compound pulpy matter containing the chyle is carried forward from the duodenum through the whole courfe of the inteftines, where it is fubjected to the continual action of the internal wrinkled membrane of the bowels, and its nutritious particles, or chyle, felected and abforbed by the lacteals that are abundantly diftributed there, and open their mouths directly within the cavity.

180 Paffage of food through the inteftines. As to the movements of the alimentary canal, the direction of hairs found in the ftomach, and the balls of hairs which are thrown up, would appear to indicate a circular motion. The inteftinal part has a motion fimilar to that of a worm, and is called the *vermicular* or *periftaltic*. Here every portion retains its own motion, although it be feparated from the reft by ligatures. The ftomach of the polype, the gullets of the ruminating kinds, and the cæca, have the motion in different directions at different times; and that obferved in the alimentary canal of a loufe is, when viewed through a microfcope in the time of action, amazingly rapid; the ftimulating caufes employed are the food, the different liquors with which it is mixed, the air, the nerves where they exift, and a portion of heat. Some degree of heat is neceffary to every procefs of digeftion, both in the animal and vegetable kingdom; what that degree is depends on the nature of the living body; and is various according to its age, its health, its employments, and habits.

With refpect to the function of digeftion in the lower claffes of animals, we can fay but little. We know that their food is diffolved in the ftomachs of the cruftacea, of mollufca, and of polypes; but whether this procefs in moft infects and worms is any thing more than imbibition, or taking in aliment, which is to undergo little change, we are uncertain. We know, indeed, that many infects live on fubftances which muft be diffolved before they enter into the pores of their bodies, and that many of them abound in acrid juices, which are well fitted for this folution. It does not appear that plants poffefs what may be called the faculty of digeftion.

181 Relations between digeftion and fenfation. The relations between digeftion and the functions we have already confidered, efpecially fenfation, are various and important. The fympathies that exift between the head and the ftomach, have been long acknowledged. Several affections of the brain are accompanied with ficknefs at the ftomach, lofs of appetite, and indigeftion; while, on the other hand, the deranged ftate of the digeftive organs feldom fails to produce giddinefs, headach, ringing in the ears, confufion or depravation of fight, &c.; and if the former fymptoms arife to a great height, as in the cafe of overloaded ftomach or furfeit, coma, or even apoplexy, is frequently produced. In many nervous affections, particularly hyfteria and hypochondriafis, in which there frequently takes place aftonifhin[illegible] accumulations of air in the ftomach and bowe[illegible] affections of the head, fuch as ftupor, [illegible]onfufio[illegible] thought, partial blindnefs, &c. fometime[illegible] proceed to fuch a height, as to threaten, or even fometimes to produce, an apoplectic paroxyfm. In many cafes thefe affections are referred immediately to the head; but are proved, in moft inftances, to depend on the difordered ftate of the alimentary canal, from the immediate relief procured by thofe remedies which promote the difcharge of air, or produce copious evacuation from the bowels. On the other hand, in fome difeafes, where the head is primarily affected, as in phrenitis hydrocephalica (water in the head), the complaint is referred to the bowels, from the coftivenefs or other difordered ftate of thefe. The daily experience of literary men fhows how much intenfe thought diminifhes the digeftive powers, and how imperfectly ftudious occupations can be carried on after a full meal. The action of the digeftive organs is alfo confiderably influenced by the mind, or the paffions. We know how readily the appetite may be diminifhed or deftroyed by fudden anger or affliction.

The action of the ftomach may even be influenced by the will. We have known a perfon who could vomit whenever he pleafed; and Dr Darwin fpeaks of another who had acquired this voluntary command over the inverted motions of the ftomach and throat, to fuch a degree, as to gain a fubfiftence by exhibiting thefe unnatural powers to the public. At thefe exhibitions he was accuftomed to fwallow a pint of red rough goofeberries, and a pint of white fmooth ones; to bring them up in fmall parcels into his mouth, and reftore them feparately to the fpectators, who called for red or white, as they pleafed, till the whole were redelivered *.

The fympathies that take place between the brain and the digeftive organs, are eafily explained, from confidering the diftribution of the great fympathetic nerve, to illuftrate which we have given a figure (fig. 1.) fhowing its courfe and diftribution from the head through the cheft, as far as the ftomach. Plate CCCCXVIII.

The relations between the digeftive and the locomotive functions, are not lefs obvious. Experience fhews how much digeftion depends on regular exercife, and how imperfectly it is carried on in the ftomach of the indolent and fedentary; while, on the other hand, when the ftomach is overloaded, voluntary motion becomes difficult and fatiguing. Spafmodic contractions of the mufcles, twitchings of the limbs, and fimilar affections, are the common attendants of indigeftion, though thefe may perhaps be referred equally to the nervous as to the mufcular fyftem. 182 Relations between digeftion and motion.

The principal morbid affections of digeftion are, naufea, flatulence, eructation, rumination (C), vomiting, heartburn, 183 Morbid affections of digeftion.

* Fordyce on Digeftion.

* Zoonomia, vol. i. p. 276.

(C) That ruminating power which is natural to the quadrupeds of the order *Pecora*, is fometimes met with in man. We have heard of perfons who regularly brought up their food into the mouth foon after eating, chewed it over again, fwallowed the juices with the faliva, and fpat out the more folid parts. In thefe cafes, the rumination is

Of Absorption. heartburn, water-braſh or *pyroſis*, loſs of appetite, and inordinate appetite; for an account of which, ſee the article MEDICINE.

CHAP. VI. *Of Abſorption.*

184 Abſorption. WE have ſaid that the chyle is taken up from the compound pulpy matter compoſed of the food and the animal juices, as it paſſes through the inteſtines, by the lacteals. This, however, is not the only abſorption that takes place in the animal body. The fluids poured out into cavities by the exhalant arteries, as well as all the ſecreted or exuding fluids, and even the ſolid materials of the ſyſtem, are taken up by the lymphatics, and carried into the circulation; the blood poured out into cells in ſome parts, is evidently abſorbed by veins; and, as we ſhall endeavour to prove, an abſorption takes place over the external ſurface of the body.

185. Organs. What is called the abſorbent ſyſtem, is compoſed, in the ſuperior animals, of the *lacteals*, the *meſenteric glands*, the *thoracic duct*, the *lymphatics*, and the *lymphatic glands*. For an account of theſe in man, ſee ANATOMY, Part I. Sect. 14. This ſyſtem, in a greater or leſs degree, is found in all animals, except ſome molluſca, inſects, worms, and zoophytes. See Cuvier's *Leçons*, tom. iv. leç. xxiii. and Blumenbach's *Comparative Anatomy*, chap. xiii.

186 By lacteals and lymphatics. The action of the lacteals and lymphatics is probably much the ſame, and is exerted in a ſimilar manner. That of the lacteals is to convey the nouriſhing parts of the food into the circulating ſyſtem; that of the lymphatics to carry to the ſame ſyſtem watery fluids, for the purpoſe of diluting the blood, and ſuch fluid or ſolid materials as are uſeleſs, or may prove noxious to the ſyſtem. The action of the lacteals may be readily ſeen on opening an animal killed two or three hours after eating; and in this way they were firſt ſeen by Aſellius. They are then found filled with a milky fluid, while, at other times, they are inviſible. That the lymphatics are the principal organs of abſorption, is now the general opinion of all phyſiologiſts, though their action in this way can ſeldom be demonſtrated. As, however, it has been ſatisfactorily proved, that the veins do not in general abſorb, and as the lymphatics that proceed from parts that contain irritating matters, are often ſeen inflamed, proving that they have imbibed a part of the irritating matter, there is little doubt that the office of abſorption belongs almoſt excluſively to the action of the lymphatics.

Mr John Hunter made ſeveral experiments to ſhew that the veins do not abſorb. He conveyed milk, coloured with various dyeing ſubſtances, or perfumed with muſk, into the ſmall inteſtines of an aſs, which was ſoon after killed. On opening the veins of the inteſtines, and allowing the blood to ſeparate into ſerum and craſſamentum, the ſerum was found neither to be tinged with the colouring matters, nor ſcented by the perfume, while the coloured milk was evident in the lacteals. That the veins, however, do in ſome caſes perform the office of abſorbents, is evident from the ſpeedy depletion of the *corpora cavernoſa penis*, after having been diſtended with arterious blood; and from a ſimilar depletion that takes place in the nipple of the female breaſt. 187 By the veins.

188 By the ſkin. The principal object in diſpute reſpecting the function of abſorption in man and the higher claſſes of animals, is, whether the ſkin poſſeſſes the power of abſorption. This queſtion, as it is both curious and important, we ſhall examine pretty much at large; and for this purpoſe we ſhall avail ourſelves of an able paper on the ſubject, by Dr George Kellie.

It had long been received as an eſtabliſhed truth, that the ſkin was an inhaling or an abſorbing organ, and that ſometimes the inhalation balanced, or even ſurpaſſed, the exhalation of the cutaneous ſurface; but of late this doctrine of inhalation has been called in queſtion, and, in the opinion of many, entirely overthrown. It has been ſaid, that this abſorption neither does nor can take place on the outſide of the cuticle; that in every caſe of apparent abſorption, the *epidermis* had been injured, or that the matter abſorbed had been mechanically forced through it, and brought into immediate contact with the ſkin.

Haller had aſſerted *, on the authority of Deſſault, that the body acquired an increaſe of weight in the warm bath; and this augmentation of weight was eſteemed an *experimentum crucis* in favour of cutaneous abſorption.

Experiments, however, have ſince been made with every neceſſary care, which ſeem to contradict the poſition, and to prove, that the body acquires no additional weight in the warm bath.

Seguin, from a great many experiments of this deſcription, concludes, that there is no inhalation, becauſe the body, ſo far from gaining, always loſt ſome part of its weight during immerſion, although much leſs than in the air in equal times †.

In other experiments again, as in thoſe of Gerard and Currie, there was no increaſe of weight; but the body was

* *Elementa Phyſiologiæ*, tom. v. p. 88.

† *La Med. Eclairée.*

is to be conſidered as a diſeaſe, depending on the inability of the ſtomach to propel the ſolid food into the duodenum.

Mr Home, in the paper we have already quoted, (N° 161—169), relates a curious inſtance of habitual rumination in a man 19 years of age, who is blind, and has been an idiot from his birth. He has a very ravenous appetite, and it is neceſſary to reſtrict him in the quantity of his food, ſince, if he eats too much, it diſorders his bowels. Fluid food does not remain on his ſtomach, but comes up again. He ſwallows his dinner, which conſiſts of a pound and a half of meat and vegetables in two minutes, and in about 15 minutes he begins to chew the cud. Mr Home was once preſent on this occaſion. The morſel is brought up from the ſtomach with apparently a very ſlight effort, and the muſcles of the throat are ſeen in action when it comes into the mouth; he chews it three or four times, and ſwallows it; there is then a pauſe, and another morſel is brought up. This proceſs is continued for about half an hour, and he appears to be more quiet at that time than at any other. Whether the regurgitation of the food is voluntary or involuntary, cannot be aſcertained, the man being too deficient in underſtanding, to give any information on the ſubject.

Of Abſorption.

was not obſerved to have loſt any thing during immerſion in the warm bath.

Now, during theſe experiments, the body was doubtleſs waſting, by the pulmonary and cutaneous diſcharges, and yet the weight of the body either continued unchanged; or where a loſs of weight was obſerved, this was conſtantly leſs, greatly leſs, than is experienced during the ſame interval in air. And we might be inclined to infer, from a truth ſo general, and ſo well aſcertained, an argument in favour of abſorption.

It might be argued, that the loſs of weight amounts to little or nothing, becauſe, during immerſion, the body acquires more by inhalation than it does or can do in the air; that the loſs by the pulmonary and cutaneous diſcharges is counterbalanced, or nearly counterbalanced, by the increaſed abſorption.

Thoſe, however, who deny abſorption, will not allow us the advantage of this argument. They tell us, that the exhalation by the ſkin and lungs is diminiſhed, which ſufficiently explains why the body loſes leſs in the warm bath than in air. But that the accuſtomed diſcharges are ſuppreſſed or diminiſhed in the warm or tepid bath, is, we apprehend, far from being proved; and, till this propoſition is made good, the argument againſt cutaneous inhalation cannot be ſecurely maintained.

One of Dr Currie's caſes deſerves farther conſideration. We allude to the caſe of dyſphagia, publiſhed by this gentleman *, in which Mr M. the ſubject of the caſe, was ſeveral times immerſed in a warm bath of milk and water, and was weighed when taken out. Mr M. it is true, gained no weight while in the warm bath; but the loſs continually going on in the air was, as in other trials, ſuſpended during the immerſions. Beſides, he always expreſſed great comfort from the bath, with abatement of thirſt; and, ſubſequent to the daily uſe of it, the urine flowed more plentifully, and became leſs pungent. An obſervation, preciſely ſimilar, is made by Mr Cruickſhank. "A patient of mine (ſays Mr Cruickſhank), with a ſtricture of the œſophagus, received nothing, either ſolid or liquid, into the ſtomach for two months; he was exceedingly thirſty, and complained of making no water. I ordered him the warm bath for an hour, evening and morning, for a month; his thirſt vaniſhed, and he made water in the ſame manner as when he uſed to drink by the mouth (H) †.

* *Medical Report*, firſt edit. p. 327.

† *Cruickſhank on the Abſorbents.*

But to return to the caſe of Mr M——. Dr Currie himſelf remarks, that the diſcharge by urine alone exceeded much in weight the waſte of his whole body; and it cannot be doubted that the diſcharge by ſtool and perſpiration exceeded the weight of the clyſters.—Thus it appears, that the *egeſta* exceeded the *ingeſta* in a proportion much greater than the waſte of his body will explain. How is this accounted for, Dr Currie aſks, unleſs by cutaneous abſorption?

That the exceſs of theſe diſcharges above the *ingeſta* and total waſte, can be accounted for by abſorption only, was indeed an irreſiſtible concluſion. Still, however, cutaneous abſorption is denied; and, when forced to confeſs, that there are caſes where the *egeſta* exceed the *ingeſta* in a much greater proportion than the waſte of the body will explain, and which can only be accounted for by abſorption, they refuſe this function to the ſkin, and beſtow it moſt liberally, and, in ſo far as we know, moſt gratuitouſly, on the lungs. We are not entitled, in return, to deny the reality of pulmonary abſorption, but we may ſurely be allowed to urge, that there is no proof that the only inhaling organ is in the lungs; and there is none againſt the poſſibility of cutaneous abſorption.

Is it not, on the other hand, proved, by the experiments of Seguin and Lavoiſier, that the exhalation greatly exceeds the abſorption by the pulmonary ſyſtem? And if this is always the caſe, we cannot explain by pulmonary inhalation alone, why the *egeſta* ſhould, in ſome caſes, exceed the *ingeſta* in a much greater proportion than the waſte of body will account for.

We now proceed to examine another claſs of experiments, much inſiſted on by thoſe who deny cutaneous abſorption; we mean thoſe experiments performed by immerſing a part of the body in ſolutions of active drugs, the abſorption of which ſhould be indicated by their uſual effect on the ſyſtem.

Seguin made numerous experiments of this kind with ſolutions of muriate of mercury (corroſive ſublimate), on ſyphilitic patients. And we are informed, that in caſes where the epidermis was perfectly ſound, neither the known effects of mercury on the body, nor any amelioration of the venereal ſymptoms, was ever obſerved.

He alſo immerſed his own arm in a ſolution of two drams of the mercurial muriate in ten pounds of water. At the temperature of 10° and 28° Reaumur, no part of the ſalt was miſſing at the end of the experiment; but when the bath was at 18° of the ſame ſcale there was a loſs of one or two grains of the muriate in the hour, though the quantity of fluid was not diminiſhed.

The explanation given by Seguin of this unexpected reſult is curiouſly ingenious, but embarraſſed, and inconſiſtent.

At the temperature of 12°, he obſerves, the exhalants are in a ſtate of contraction, and their orifices nearly cloſed. When the heat again is raiſed to 26°, the exhalation is ſo rapid, that nothing can enter the veſſels from without; but at 18° of temperature, the orifices of the exhalants are ſufficiently relaxed, and the exhalation at the ſame time ſo conveniently languid, that the ſolution reſts quietly in contact with the matter of perſpiration in the mouths of the exhalants, where it is ſomehow or other decompoſed; a part of the ſalt leaving the water of ſolution, and combining with the perſpirative matter, with which it is carried into the ſyſtem *. Carried into the circulation by the exhalants! Is not this a plain acknowledgment of the reality of inhalation? But if in one caſe ſubſtances may thus be carried into the circulation, why not in many others?

* *La Méd. Eclairée*, tom. iii. p. 238.

Surely if the weight continues undiminiſhed, in circumſtances

(H) That thirſt may be allayed by immerſion in water, is fully proved by the experience of ſhipwrecked mariners, who, when obliged to take to their boats with very little freſh water, frequently have recourſe to bathing in the ſea, or covering themſelves with a ſhirt wetted in ſalt water, and thus quench their thirſt, nearly as well as if they had drunk freſh water.

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cumſtances where the body is continually loſing, we may infer, that ſomething has been gained by abſorption. And where the egeſta exceed the ingeſta in a proportion much greater than the waſte of the body will explain, there abſorption muſt have been going on.

The caſe of Mr M——, publiſhed by Dr Currie, is not ſingular. The writings of phyſicians abound in ſimilar examples. They had often occurred to that excellent clinical practitioner De Haen, who was therefore perſuaded that water was imbibed †. Haller too, with his uſual induſtry, has collected a great many obſervations of the ſame kind ‡.

† *Ratio Medendi*, part iv. chap. 3.

‡ *Elem. Phyſiol.* tom. v. p. 90.

Again, when phyſicians were engaged in their extenſive ſtatical experiments, weighing themſelves, their *ingeſta* and *egeſta*, for many months, nay for years together; they ſometimes obſerved, that ſo far from loſing, they had gained weight, eſpecially during cold and moiſt weather. Thus, Rye, under a cold and humid atmoſphere, gained 13 ounces. Linnings, during two hours expoſed to cold, acquired 8½ ounces. The abbé Fontana, after two hours expoſure to a moiſt atmoſphere, returned home ſome ounces heavier than he went out. De Gorter gained 6 ounces in one night; and on other occaſions, two ounces and four ounces. Theſe obſervations are confirmed alſo by the experience of Dr Francis Home, profeſſor of Materia Medica in the univerſity of Edinburgh. 'Having fatigued myſelf pretty much (ſays he) in the afternoon, I went to bed without ſupper, and was ſo hungry that I could not fall aſleep for ſome time. Betwixt eleven at night and ſeven next morning I had gained two ounces ‡.'

‡ *Medical Tracts and Exper.* p. 250.

Here then are examples of the body gaining conſiderably more than the *ingeſta* will account for, acquiring weight when neither food nor drink had been ſwallowed. And we have the concurring teſtimony of the moſt reſpectable writers ſupporting the ſame truth.

How can this increaſe of weight be accounted for, unleſs by abſorption? In ſuch experiments, the *loſs of weight*, which cannot be accounted for by the ſenſible *egeſta*, is attributed to the exhalation; the increaſed weight ſometimes obſerved, and which cannot be explained by the ſenſible *ingeſta*, muſt in like manner be referred to the *inhalation*.

That the ſyſtem may be affected by active medicines introduced and abſorbed by the ſkin, cannot be denied. And were proofs ſtill wanting to eſtabliſh the doctrine of cutaneous abſorption, this argument might be inſiſted on. It is true, that friction is commonly employed when we wiſh to introduce medicines by the ſkin, by which, it is ſaid, the ſubſtance is mechanically forced through the cuticle, and brought into contact with the abſorbents of the true ſkin. The ſyſtem, however, may be affected without friction, for example, by wearing a mercurial plaſter, and more certainly by mercurial fumigation, as practiſed by Lalonette and others *.

* *Edinb. Med. and Surg. Jour.* vol. i. p. 181.

It might even be concluded from an examination of the ſtructure of the ſkin, that abſorption muſt take place at its ſurface. We know that the cuticle is porous, and is penetrated by exhaling veſſels; we know that lymphatics commence immediately below it; and we know that when certain ſubſtances are applied to the cuticle, eſpecially when this application is aided by moderate friction, as in the caſe of applying garlic poultices to the feet, and the more familiar inſtance of mercurial inunction, that theſe ſubſtances are taken up by the abſorbents, and conveyed into the circulation.

From a conſideration of all theſe circumſtances, we think it fully proved, that the ſkin is an abſorbing or inhaling organ. For further proofs we may refer our readers to Bichat's *Anat. Gener.* tom. iv. p. 691.

189 Suppoſed retrograde action of the lymphatics.

Mr Charles Darwin, ſon of the late Dr Darwin, publiſhed in 1780, a Latin theſis, which is tranſlated in the 29th ſect. of his father's Zoonomia, vol. i. in which he attempts to prove, that the valves of the lymphatics are ſo formed as in particular caſes to admit of the regurgitation of the abſorbed fluids. The arguments on which he founds this opinion (beſide the difficulty of accounting for the phenomena of ſeveral diſeaſes on any other principle), are chiefly the following:

Firſt, The mouths of the lymphatics ſeem to allow water to paſs through them after death, the inverted way, more eaſily than in the natural direction.

Secondly, In ſome diſeaſes, as diabetes and ſcrofula, it is probable the valves themſelves are diſeaſed, and are thence incapable of preventing the return of the fluids they ſhould ſupport.

Thirdly, There are valves in other parts of the body, analogous to thoſe of the abſorbent ſyſtem, which are liable, when diſeaſed, to regurgitate their contents.

Fourthly, The capillary veſſels, which muſt be conſidered as analogous to abſorbents, may be ſeen, in animals ſubmitted to the microſcope, to regurgitate their contents into the arteries, during the ſtruggles of the dying animal.

By means of this hypotheſis (for notwithſtanding the arguments adduced in its favour, we can call it no better) Mr Darwin explained the ſpeedy paſſage of watery fluids from the ſtomach to the urinary bladder; the phenomena of diabetes; diarrhœa, dropſy, cold ſweats; tranſlations of matter, chyle, milk, and urine; the operation of external remedies, &c.

190 Abſorption in the loweſt claſſes of animals.

In all thoſe claſſes of animals that poſſeſs a complete abſorbent ſyſtem, the phenomena of abſorption ſeem to proceed much in the ſame manner as in man; but in ſome of the inferior animals, eſpecially in molluſca and worms, this function ſeems to be performed by the veins *. In the *echinodermata*, however, eſpecially in the ſea-urchin (*echinus eſculentus*), lymphatics have been demonſtrated by the ſecond Monro. In inſects and polypes there is no proper abſorption.

* *Cuvier Leçons*, tom. iv. p. 161.

191 Abſorption of plants.

The abſorbing veſſels of plants are chiefly the fibrils of the roots, which evidently imbibe moiſture, and perhaps gaſeous fluids, from the earth; but there have alſo been demonſtrated veſſels opening beneath the outer bark, which botanical phyſiologiſts conſider as lymphatics. "Lymphatic veſſels (ſays Wildenow), are found in the epidermis of plants, and are of great minuteneſs, anaſtomoſing in various ways through ſmall intermediate branches." They ſurround the apertures of the cuticle, by which the inhalation and exhalation of vegetables are carried on; but they are ſo minute as not to have yet been filled with coloured liquids. Round each opening, which is commonly ſhut by a moveable valve, they form a circle, rarely a rhombus, as in the *zea mays*. In the *lilium calcedonicum*, thoſe veſſels run obliquely, and ſomewhat in an irregular undulating manner, fig. 2. In the common onion (*allium cepa*), they run in a ſtraight, though oblique and regular form, fig. 3. In the pink, (*dianthus*

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(*dianthus caryophyllus*), they are very ſtraight, with ſtraight and horizontally tranſverſe branches, fig. 4. In almoſt every plant they have their certain and peculiar direction, which in each remains conſtantly the ſame*.

* *Wildenow's Princ. of Bot.* ſect. 236.

The theory of abſorption is ſtill but imperfectly underſtood. We ſhall briefly notice the principal hypotheſes that have been brought forward to account for the

192 Theory of abſorption. entrance of ſubſtances into the mouths of the abſorbing veſſels; for this part of the proceſs alone ſeems to be diſputed.

It was long the opinion of phyſiologiſts, that fluids enter the mouths of the abſorbents on the principle of capillary attraction; but as the abſorbing veſſels are not circumſtanced like rigid capillary tubes, immerſed in a fluid; and as, were this hypotheſis juſt, abſorption ſhould go on with regularity, and all fluids ſhould be abſorbed indiſcriminately, neither of which circumſtances is true; this hypotheſis is now generally abandoned.

Mr John Hunter accounted for the entrance of ſubſtances into the mouths of the abſorbents, by attributing to the mouths of theſe veſſels a power of nibbling, ſimilar to that exerted by a caterpillar when feeding on a leaf. This opinion may be called ingenious, but is certainly very wild and fanciful.

Dr Fullarton, in a theſis on abſorption, publiſhed at Glaſgow in 1800, attributes to the abſorbing orifices, a power of ſuction ſimilar to that of the proboſcis of butterflies, and the tentacula of ſome marine animals.

The firſt and third of theſe hypotheſes ſuppoſe the abſorbents incapable of taking up any but fluid ſubſtances; but we well know that even the hardeſt bones are ſomehow abſorbed, and conveyed to the circulation. We muſt therefore add another hypotheſis, which ſuppoſes that there is ſecreted in the animal body, a fluid capable of diſſolving fleſh and bones†. The hypotheſis, however, is without foundation. It is contrary to the ſimplicity of the animal economy, that there ſhould take place, firſt, a ſecretion of ſolid matters to compoſe the ſtructure of the body, and then a ſecond ſecretion to diſſolve them. We muſt therefore conſider this part of phyſiology as a ſubject of future inveſtigation.

† *Duncan's Med. Com.* vol. x. p. 354.

When the abſorbed ſubſtances have once paſſed the barrier of the firſt valve, it is not difficult to account for their further progreſs through the lymphatics. A continual ſucceſſion of freſh abſorbed matter muſt drive forward what is already in the veſſels, while the valves muſt in general prevent its reflux. The impelling force from behind is alſo probably aſſiſted by the irritability of the veſſels. It is not ſo eaſy to decide how the abſorbed matters paſs through the glands, if, as is generally believed, they do not in theſe form continuous tubes, there muſt be a freſh abſorption by the mouths of the veſſels that paſs out of the gland, which is as difficult to account for as the firſt reception at the origin of the veſſels.

193 Relations of abſorption with the preceding functions. The relations that take place between abſorption and the preceding functions, are perhaps the leaſt underſtood of any that occur in the animal economy. We know that the action of the abſorbents is greatly aſſiſted by muſcular motion, and that it is in general moſt defective in indolent and ſedentary perſons. An evident ſympathy is alſo obſerved between the ſtomach and the abſorbents. Nauſea, and eſpecially vomiting, are powerful promoters of abſorption, and ſome remarkable inſtances are related of the ſpeedy abſorption of a large quantity of purulent matter from an abſceſs, in conſequence of violent vomiting.

Chap. VII. *Of Circulation.*

194 Circulation. We have traced the nutritious particles of the food from the inteſtines through the *lacteals*, the *menſenteric glands*, and the *thoracic duct*, into the left *ſubclavian vein*, where we find the chyle is mixed with the venous blood, and carried to the right auricle of the heart. We muſt now conſider how the fluids are conveyed to every part of the body, or we muſt examine the function of *circulation*.

195 Organs. This function takes place in all the vertebral animals, and in molluſca, worms, and cruſtacea; but there appears to be no real circulation in inſects, zoophytes, and plants.

The organs by which circulation is performed differ eſſentially in the ſeveral claſſes of animals. Thoſe of the human ſyſtem have been deſcribed in the firſt part of ANATOMY, ſect. x. and xi. and a brief comparative view of theſe organs in the inferior animals, has been given in the ſecond part of that article, N° 154, 201—204, 300, &c. and in the articles CETOLOGY, ERPETOLOGY, ICHTHYOLOGY, and ORNITHOLOGY. For a fuller account of theſe latter, we may refer to Cuvier's *Leçons*, leç. xxiv and xxv. and to the Comparative Anatomy of Blumenbach, chap. xii.

196 Pulmonic and ſyſtemic parts. It is well known that, in the red-blooded animals, the blood is not of the ſame ſhade of red in every part of the body; but that what has paſſed through the lungs, and is circulating through the arteries that proceed from the aorta, is of a florid red colour, while that which is ſent to the lungs by the pulmonary artery, as well as that which is returning from the extremities of the arteries through the veins, is of a purple or crimſon colour. As one ſet of organs always contains florid, and another ſet always crimſon blood, it is convenient to diſtinguiſh each ſet by an appropriate name. Dr Barclay has done this, and he calls that ſet of organs which are employed to convey the blood from the arteries, and diſtributed to the lungs, *pulmonic*, compriſing the *pulmonic veins*, viz. the vena cava and its branches, *pulmonic auricle*, *pulmonic ventricle*, and *pulmonic arteries*: while he denominates that ſet of organs which return the blood from the lungs, and diſtribute it to the ſyſtem, *ſyſtemic*, comprehending the ſyſtemic veins (pulmonary veins), ſyſtemic auricle, ſyſtemic ventricle, and ſyſtemic arteries, (the aorta and its ramifications). One great advantage of this nomenclature, is that it prevents the ambiguity of the expreſſions *right* and *left*, *anterior* and *poſterior*, applied to the auricles and ventricles of the heart. We ſhall therefore employ them in the ſubſequent part of this chapter*.

* See *Barclay on Muſcular Motions*, p. 231.

For an account of the nature and properties of the blood, ſee ANATOMY, Part I. ſect. 14. and CHEMISTRY, N° 2642.

It may not be improper, in this chapter, to notice the principal arguments that have been uſed to prove the circulation of the blood. They are as follow:

197 Proofs of the circulation of the blood. 1. When an artery is tied, the part of the artery that is betwixt the ligament and the heart, ſwells; but that part of it which is betwixt the ligature and the remote branches, becomes more flaccid than before. On the other hand, when a vein is tied, the part between the ligature

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gature and the remote branches, swells, while the part between the ligature and the heart becomes flaccid.

2. The valves placed at the mouths of the aorta and pulmonary artery, must prevent the blood from regurgitating into the ventricles, while they permit it to flow forward through the arteries, into the capillary branches of the veins. Again, the valves situated in the course of the veins prevent the blood from flowing back into the arteries, while they permit it to proceed forward through the venous trunks into the heart.

3. By the assistance of a microscope, the blood may be seen in the pellucid parts of animals, as the feet of frogs, flowing from the arteries into the veins.

4. When an artery of moderate size is wounded, and not secured by ligature or compression in proper time, the blood flows out till the animal be dead.

5. Any thin liquid, when injected into an artery, does not pass backwards into the heart, but flows forward into the inosculating veins. On the other hand, such a liquid thrown into a vein, flows towards the heart, and not into the smaller branches of the vein.

The phenomena of circulation in the human body have been already mentioned under ANATOMY, sect. xii. and xiii. and under MEDICINE, N° 95. We shall here only offer a compendious view of the course of the blood in the adult and in the fœtal state.

198 Circulation in the adult man.

I. After birth, the blood coming from every part of the body through the numerous ramifications of the vena cava, is poured into the right or pulmonic auricle of the heart, by the contraction of which it is thrown into the right or pulmonic ventricle, which contracting, throws it into the pulmonary artery, being prevented from regurgitating into the auricle by the action of the tricuspid valves. It is now, by means of the ramifications of the pulmonary artery, distributed through the lungs, from which it is brought back by four principal pulmonary veins, and poured into the left or systemic ventricle, which contracting with great force, propels it into the aorta, it being prevented from regurgitating into the auricle by the action of the mitral valves. The blood being propelled into the aorta, is by its trunks and branches, distributed to every part of the body, and brought back as before by the ramifications and trunks of the *vena cava*.

199 Circulation in the human fœtus.

II. In the fœtal state, the blood being brought back from every part of the body by the ramifications and trunks of the vena cava, is poured into the pulmonic auricle of the heart, where it is mixed with the blood brought from the placenta. A part of this blood is conveyed from the sinus of the auricle while in a state of dilatation, through the oval hole, into the systemic auricle; while another part, by the contraction of the auricle, is thrown into the pulmonic ventricle, which contracting, propels it into the root of the pulmonary artery. From this the greater part of the blood passes through the arterious canal, that in the fœtus joins the pulmonary artery to the aorta, into this latter; while the remainder is distributed by the ramifications of the pulmonary artery to the lungs, and brought back by the pulmonary veins to the systemic auricle of the heart. By the contraction of this auricle, the blood is thrown into the systemic ventricle, which contracting, propels it into the aorta. Now, while one part of the blood is distributed by the numerous ramifications of the aorta to every part of the body of the fœtus, another part is carried from the internal iliac arteries, through the two umbilical arteries, into the placenta, from which it is conveyed through the umbilical vein to the sinus of the liver. Hence, one part of the blood, without entering the liver, is transmitted by a branch of the umbilical vein, called *venous duct*, into the left branch of the *vena cava hepatica*; thence into the inferior great vena cava; while another part, by another branch of the umbilical vein, flows into the left branch of the *vena porta*, by the numerous ramifications of which it is distributed to the liver. From the liver it is carried by the *venæ cavæ hepaticæ* into the inferior great *vena cava*, whence it is conveyed with the rest of the blood, to the pulmonic auricle of the heart, to be distributed as before.

200 Powers carrying on the circulation.

We must now briefly consider the powers by which the blood is made to circulate through such a multitude of vessels, so infinitely ramified, and differing so much in their diameter. It seems generally allowed at the present day, that these powers are chiefly the immediate muscular action of the heart, the action of the arteries, the valves of the veins, and the pressure produced on some of the veins by the action of the muscles that lie contiguous to them.

201 Action of the heart.

1. That the heart must possess very considerable force in propelling the blood through the arteries, may be supposed from the great muscularity of its ventricles; and this force has been proved by experiment and observation. From experiments made by Hales, viz. that of inserting a glass tube into a large artery, and measuring the height to which the blood ascends at each pulsation, it has been calculated, that the human carotid artery is capable of projecting its blood to a perpendicular height of seven feet and a half; and if we estimate the surface of the systemic ventricle at 15 square inches, we shall find that it sustains a pressure of 1350 cubic inches, equal to 51 pounds weight, which it has to overcome by its contracting force *. This is a moderate computation of the force of the heart, for Borelli estimates it at 180,000 pounds, while Keill diminishes it to eight ounces. Senac again, from having observed, that if a weight of 50 pounds be attached to the foot, with the knee of that side placed over the opposite knee, the weight will be raised at each pulsation, and allowing for the distance at which the weight is placed from the centre of motion, computes the force of the heart at 400 pounds †. Blumenbach has seen the blood projected from the carotid of an adult more than five feet ‡. On a medium calculation, estimating the quantity of blood contained in the body at 30 pounds, the number of pulsations in each minute at 75, and the quantity of blood ejected from the systemic ventricle at each contraction at two ounces and a half, we shall find that the whole 30 pounds of blood will be carried through the whole body no less than 23 times in an hour, or the circulation will be completed in less than three minutes. From these circumstances we must infer that the impelling power of the heart is very great, and fully adequate to the office which it has to perform.

* *Hales's Statical Essays*, vol. ii.

† *Traité du Cœur.*

‡ *Institutiones Physiolog.*

Various hypotheses have been formed to explain how the heart and arteries are excited to motion, but our limits will not permit us to detail them. Our readers will find them related at considerable length, and fully examined in the *Principes de Physiologie* of Dumas, tom. iii.

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iii. p. 332—364. The general opinion at present entertained on this ſubject is, that the heart is excited to action by the ſtimulus of the blood.

202 Action of the arteries.

2. Although it is more than probable that the action of the heart is the principal inſtrument in carrying on the circulation, there can be no doubt that the arteries contribute eſſentially to this office. They are evidently muſcular, and are poſſeſſed of conſiderable irritability; are ſupplied with numerous nervous filaments, and are nouriſhed by ſmall arterial branches, commonly called *vaſa vaſorum*. Nay, we know that they are ſuſceptible of contraction; for when we divide an artery in the living body, the divided extremities gradually contract, till, if the animal is not killed by the experiment, the aperture is at length obliterated *. Laſtly, there have been inſtances of fœtuſes without a heart; and as we muſt ſuppoſe that, during the life of the fœtus, the circulation was going on, it is a natural inference that this was chiefly effected by the contraction of the arteries, and not entirely by the impelling power of the circulating ſyſtem of the mother.

* Hunter on the Blood, p. 114.

203 Valvular ſtructure of the veins.

3. It cannot be ſuppoſed that the veins have any immediate action on the blood, as they exhibit no circular fibres like the arteries, except in the immediate vicinity of the heart; but their valvular ſtructure muſt contribute to the carrying on of the circulation, from the oppoſition it gives to the return of the blood, ſo that what is called the *vis à tergo*, or impelling power from behind, aided by the conical form of the veins, may have its full effect.

204 Action of the muſcles.

4. That the action of the muſcles has conſiderable influence in propelling the blood towards the heart, in thoſe veins that lie in their neighbourhood, is evident from the effect that bodily exerciſe produces in accelerating the circulation, and from the efficacy of friction in removing congeſtions of blood in the veins of the extremities, and in the more familiar inſtance of promoting the ſwelling of the veins of the arm by the ſame means in the operation of bleeding.

205 Circulation of the inferior animals.

The circulation in thoſe animals whoſe ſtructure approaches to that of man, differs little from what is above deſcribed. There are indeed ſome peculiarities, a few of which we ſhall preſently notice. An account of the circulation in the cetacea will be found in the article CETOLOGY, N° 140—145, that of the reptiles is deſcribed under ERPETOLOGY, p. 309.

206 Circulation of the molluſca;

The molluſca poſſeſs an evident and powerful circulation. Moſt of them have a ſimple heart, conſiſting of one auricle and one ventricle; and in theſe the vena cava performs the office of an artery, carrying the returning blood to the gills, whence it paſſes to the auricle, and is afterwards thrown into the aorta. There is a peculiarity in the cuttle fiſh, which has a heart conſiſting of three ventricles, without any part that can properly be called an auricle. Two of the ventricles are placed at the roots of the two bronchiæ, and have each a branch of the vena cava, by which they receive the blood from the body, and propel it into the bronchiæ. The returning veins open into the middle ventricle, and from this the aorta proceeds.

207 in the vermes;

Some of the vermes, as the leech, and the tribes of the *naias*, *nereis*, and *aphrodita*, and ſome ſpecies of *lumbricus*, have no heart, but they have circulating veſſels with evident contraction and dilatation.

208 in cruſtacea.

In the *cruſtacea*, the circulation is performed by a ſingle ventricle, expelling the blood into the arteries of the body, and receiving it again after it has paſſed through the gills, in a manner very ſimilar to the circulation of fiſhes.

209 Contracting and dilating tube in inſects.

There is no circulation in inſects; but theſe animals have running along the back a membranous tube, in which alternate contractions and dilatations are perceptible. This tube, however, is cloſed at both ends, and has no veſſels proceeding from it.

210 No circulation in plants,

From the reſearches which evince circulation to be a function ſo general among animals, ſome are diſpoſed to think it takes place in all living bodies. But notwithſtanding the faſhionable language of circulating fluids, of veins, arteries, and even of valves, in the vegetable ſtructure; yet nothing performing the office of a heart, and nothing that ſeems to conduct fluids in a circular courſe, has been found in plants. In the vegetable kingdom, the chyle is diſtributed to all the parts, from the numerous veſſels which convey the ſap; and theſe veſſels, being fitted by their ſtructure to carry the ſap either downwards or upwards, from the branches to the roots, or from the roots to the branches, is the reaſon why plants inverted in the ground will ſend forth roots from the place of their branches, and ſend forth branches from the place of their roots. Even a ſimilar diſtribu-

211 nor in ſome animals.

tion of the chyle takes place in ſome animals. In the human tænia, in the *faſciola hepatica* (fluke) of ſheep, and in moſt polypes, the chyle, without a circulating ſyſtem, is conveyed directly to the different parts from the alimentary canal.

For an account of the motion of ſap in plants, ſee Darwin's *Phytologia*, a paper by Mr Knight in the *Philoſophical Tranſactions* for 1801, Wildenow's *Principles of Botany*, ſect. 276, and the article PLANT in this Encyclopædia.

212 Relations between circulation and ſenſation.

The relations that ſubſiſt between the function of circulation, and thoſe which we have already conſidered, are very important. We ſhall begin with thoſe of circulation and ſenſation. That the functions of the nervous ſyſtem muſt be conſiderably influenced by the circulation of the blood, may be ſuppoſed *à priori*, from the large quantity of blood ſent to the head, this being, on a moderate calculation, about one-tenth of the whole. A certain quantity of blood in the veſſels of the brain ſeems eſſential to the due performance of the functions of that organ; and thoſe animals, which, like man, have the blood ſent in greateſt quantity, and with greateſt impulſe, ſeem to poſſeſs the faculties of the brain in the greateſt perfection, while thoſe in whom the motions of the blood towards the head is much retarded, as in the ſheep and cow, are remarkable for mildneſs and ſtupidity. When, however, the quantity of blood becomes too great, or its impetus too violent, the faculties of the brain are impaired, or altogether deſtroyed. No man, and very few other animals, can remain ſuſpended with the head downwards for any long time, without dangerous, and commonly fatal conſequences. The bat, indeed, is a remarkable exception to this rule, for this animal can hang by its hinder feet for days or weeks together, with perfect ſafety, a circumſtance that may be accounted for from the very ſmall quantity of blood contained in its circulating veſſels. Again, the brain exerts an evident influence on the circulation. It is well known how much the action of the heart and arteries is quickened, impeded, or rendered irregular, by the

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the passions of the mind. Cases are recorded in which these passions, carried to excess, have altogether stopped the circulation, and produced instant death. Fainting is often brought on by the sight of a disgusting or terrifying object, or by the odour of perfumes, or of substances to which the person has a particular antipathy. The sympathy between the heart and the nervous system is farther shown by the violent pain below the *sternum*, and sometimes in the arm, in cases of organic disease of the heart.

The circulation is even affected by intense thought; and we have heard of a bleeding from the nose being brought on by long and deep study, while the body was in a reclining posture, namely in bed.

213 Relations between circulation and motion.

The functions of circulation and motion are intimately related. It is scarcely necessary to notice the acceleration of the pulse, in consequence of exercise and labour, or to remark that in indolent and sedentary people the circulation is generally slow and languid. In general, too, the blood circulates with most rapidity in those animals who are formed for quick motion, though the instance above quoted, of the bat, shows that the quickness of motion does not depend on the quantity of blood. Several curious anatomical facts have rendered it probable, that the production of quick or slow motion depends in a great measure on the mode in which the arterial branches are distributed to the moving organs. The arterial branches that supply the organs of voluntary motion, are divided in such a manner as to impede the motion of the blood towards these organs as little as possible: their ramifications are therefore few, and they go off from the trunk at very acute angles; whereas those that supply the viscera are at nearly right angles, are often tortuous, and are otherwise so constructed as frequently to impede the flow of blood. Physiologists have even explained the greater power that is generally found in the right arm, and the greater readiness with which most people use that arm, by the manner in which the right subclavian artery comes off from the aorta. This indeed we are disposed to consider as fanciful, and to attribute the more ready use of the right arm solely to habit and early instruction not to employ the left.

214 Distribution of the arteries in the limbs of slow-moving animals.

In some animals that are remarkable for slowness of motion, as the *lemur tardigradus*, or slow lemur, and the *bradypus tridactylus*, or common sloth, there is a curious construction of the arteries that are distributed to the limbs of these slow-moving animals, which must have the effect of breaking the force, and impeding the velocity of the blood towards these limbs. In the *lemur tardigradus*, a specimen of which was dissected by Mr Carlisle, it was found that the *subclavian artery* and the *external iliac* were, soon after rising from the general trunk, divided into a great number of equal-sized cylinders surrounding the principal artery, now diminished to a very small size, and that each of these branches was sent to each of the principal muscles of the limbs, while the other arteries that supplied the other parts of the limbs were divided in the usual arborescent form. Struck with this appearance, Dr Shaw and Mr Carlisle afterwards examined several specimens of the sloth, and found a similar conformation, while in other species of bradypus, not remarkable for slow motion, no such appearance took place*. Fig. 5 & 6. Plate CCCCXVIII. represent the division of the arteries in the slow lemur above described.

* Shaw's General Zoology, vol. i.

215 Relations of circulation with digestion.

The relations between the circulating and digestive organs are proved by the sudden acceleration of the pulse from stimuli received into the stomach; from the diminished circulation or sudden cessation of the heart's motion from powerful sedatives received into the same organ, especially the *prunus lauro-cerasus*; from the irregularity produced in the circulation in consequence of *dyspepsia*, and many other considerations.

216 Relation of circulation and absorption.

That there is an intimate relation between circulation and absorption, cannot be doubted, though the nature and effects of this relation are not yet well understood. We know that the vessels sympathize with the absorbents in their activity or languor; that when the absorbents are languid in their action, the blood-vessels, especially the exhalants, are in a feeble or relaxed state, and that the absorbents are often roused to greater action by remedies that first act on the circulation.

217 Action of the vessels on the blood.

Numerous experiments have shown how much the colour and consistence of the blood are altered by the mere action of the vessels; and this discovery has enabled us to conjecture with more probability than we did formerly, why in infants and phlegmatic persons the blood is paler, in the choleric more yellow, and in the sanguine of vermilion red. It explains likewise in some measure, why the blood varies in the same individual, not only with regard to the state of health, but likewise at the same instant; and why the blood which circulates through the veins has not the same intensity of colour, nor the same consistence, as that of the arteries; and why the blood which flows through the organs of the breast differs from that which passes languidly through the viscera of the lower belly. This power of the vessels over the blood will bring us also to the true cause why the vessels vary in the density of their coats and in their diameters; why they are sometimes convoluted in a gland, and why they sometimes deposit their contents in a follicle; why they are sometimes of a spiral form; why the branches strike off at various angles; why they are variously anastomosed; why they sometimes carry the blood with dispatch, and sometimes slowly through a thousand windings. By these means their action is varied, and the blood prepared numerous ways to answer the ends of nutrition and secretion.

On the varieties of the *pulse*, and the morbid affections of circulation, see MEDICINE, N° 96—104.

CHAP. VIII. *Of Respiration.*

218 Necessity of respiration.

WHILE the fluids are passing through the body, by what is called the *greater circulation*, they give out certain parts or principles, partly for the purpose of nutrition, and partly to free the system from noxious matters. In order to regain some of the principles which they have lost, it is necessary that they should be exposed to the influence of atmospheric air; for which purpose they are made to pass through appropriate organs, which, as we have already observed, are in general either lungs or gills. The action by which the fluids and the air are made to act on each other, is called *respiration*, and consists of two kinds, *inspiration*, by which the air is received into the body, and *expiration*, by which it is again thrown out.

So essential is respiration to the system, that snails, chameleons, and some other animals, can live for years, without any apparent nourishment, provided they be not excluded

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excluded from air. We have ſeen a chameleon that lived, and was vigorous, for 22 months, without any food, and which might have continued to live much longer, but for an unfortunate bruiſe by a fall.

Other phenomena equally demonſtrate the importance of air to the living body. The frog leaps away wanting its heart; it ſurvives the loſs of the greateſt part of its ſpinal marrow; without its head, it lives for ſome days, and its heart continues to circulate its blood. Borelli found, that eels and ſerpents, though their bodies be opened, and the whole of their bowels be taken out, are able to move for a day after, and yet, in all theſe animals, the life is obſerved to be ſuddenly extinguiſhed when the all-vivifying air is excluded. Even the ſmalleſt inſect has died, and the plant loſt its vegetative power, when retained for any conſiderable time in a vacuum. Fiſhes themſelves, when placed under an exhauſted receiver, have ſtarted anxiouſly to the ſurface of the water in queſt of freſh air; and finding none, have ſunk to the bottom and expired in convulſions. It will preſently appear that this neceſſity of air to life is general in all the claſſes of organized beings (K).

219 Organs. The organs of reſpiration belonging to the human ſyſtem, viz. the *larynx*, windpipe, lungs, diaphragm, ribs, and numerous muſcles, have been ſufficiently deſcribed in various parts of the article ANATOMY; and ſome account of theſe organs in the inferior animals has been given in the ſecond part of that article, N° 155, 156, 206, 208, 271—274, and in the articles CETOLOGY, ERPETOLOGY, and ICHTHYOLOGY. For a more complete account of the reſpiratory organs in the inferior animals, the reader is referred to Cuvier's *Leçons d'Anatomie Comparée*, Leç. xxvi. et xxvii. and to Blumenbach's *Comparative Anatomy*, chap. xiv. and xv.

220 In examining the function of reſpiration in warm-blooded animals, two circumſtances are principally to be conſidered; the mechaniſm of reſpiration, or the mechanical means by which the organs are enabled to receive and expel the air, and the effects produced by reſpiration on the circulating fluids, and on the ſyſtem at large. Our principal object in this article is briefly to explain the mechaniſm of reſpiration; to notice the effects produced on the air by the reſpiration of different animals, with the effects produced on them, and the relations that take place between reſpiration and the preceding functions of ſenſation, motion, digeſtion, and circulation.

221 Mechaniſm of reſpiration in man. In order to make an inſpiration, the intercoſtal muſcles, and the muſcular fibres of the diaphragm, are thrown into contraction, while at the ſame time the abdominal muſcles, and the muſcular fibres of the windpipe, are relaxed. By theſe means the diaphragm being drawn towards the *ſacrum*, and rendered leſs convex towards the cheſt, and the ribs being drawn upwards (or forwards in quadrupeds), the cavity of the cheſt is enlarged, and the air remaining in the lungs being rarefied, the external air ruſhes in through the windpipe by its own gravity, and diſtends the lungs. In making what is called a very deep inſpiration, other muſcles that are connected with the atlantal ribs, viz. thoſe called *ſcaleni, trapezii, cervicales deſcendentes, ſerrati ſuperiores*, and pectoral muſcles, aſſiſt to elevate the ribs more than in an ordinary inſpiration. By the action of the intercoſtal muſcles the ribs are drawn *atlantad* (upwards in man, and forwards in quadrupeds), becauſe the moſt atlantal rib on each ſide of the thorax is fixed, and therefore all the other ribs are drawn towards it; and they are alſo drawn peripherad (outwards), becauſe their greater curvature is in the direction of the *ſacrum*, and becauſe they turn on their vertebral extremities as on a fulcrum.

In order to make an expiration, the abdominal muſcles, and the muſcular fibres of the windpipe, are contracted, while the intercoſtal muſcles, and the muſcular fibres of the diaphragm are at the ſame time relaxed. By theſe means, aided by the elaſticity of the cartilages of the ribs, and perhaps of the mediaſtinum, the ribs are drawn ſacrad (towards the ſacrum), while the diaphragm, partly by its own muſcular action, and partly in conſequence of the preſſure of the bowels, is rendered convex towards the cheſt. Thus, this cavity is conſiderably diminiſhed, the lungs are compreſſed, and part of the air is expelled through the windpipe. In making a ſtrong expiration, little more is neceſſary than a more powerful contraction of the abdominal muſcles.

The mechaniſm of reſpiration in mammalia is ſo ſimilar to that of man, that we need not enter into it; that of *cetacea* has been ſufficiently explained under CETOLOGY, N° 146—151; that of birds may be gathered from what has been ſaid on their ſtructure, in the comparative part of ANATOMY, N° 271, and in ORNITHOLOGY, N° 37; that of reptiles has been fully explained under ERPETOLOGY, page 311; and that of fiſhes under ICHTHYOLOGY, page 73. The mechaniſm of this function in the claſſes of animals below theſe is ſo ſimple, that a conſideration of it is unneceſſary. In inſects the air enters the numerous ramifications of the *tracheæ*; is carried by them into every part of the body, and is then returned by the ſame paſſages. In ſome of the molluſca, reſpiration proceeds in a ſimilar manner, by the ramifications of the pulmonary veſſels that enter by the neck; but in moſt of theſe, and in all the loweſt tribes, ſuch as worms and zoophytes, reſpiration ſeems to be carried on entirely by the pores of the ſkin. 222 In other animals.

Many attempts have been made to aſcertain the quantity of air received and emitted in a ſingle inſpiration or expiration. See CHEMISTRY, N° 2535. This point is not yet fully aſcertained, but we may probably eſtimate the quantity expelled by each ordinary expiration at one-ſeventh part of the whole contents of the lungs, and that of the moſt violent expiration at about four-ſevenths 223 Quantity of air received and emitted.

(K) It was long ago obſerved by Pliny, that if the bodies of inſects are beſmeared with oil, they ſoon periſh: "*oleo illito inſecta omnia exanimantur.*" The ſame obſervation was afterwards made by Ray, who explained it by ſhowing that in this way the pores through which the animals breathe are ſtopped. Mayow alſo found, that if the oil be applied only to ſome of theſe pores, the neighbouring parts become paralytic, while the reſt of the body continued ſound. See Ray's *Wiſdom of God*, and Mayow's *Tractatus*.

ſevenths of thatquantity; or that the medium quantity of air conſumed during a common inſpiration or expiration is about 40 inches.*.

* *Boſtock on Reſpiration*, p. 35.

224
Ordinary number of reſpirations in a minute.

Another circumſtance reſpecting the mechaniſm of reſpiration merits notice, viz. the ordinary number of reſpirations made in a minute by a healthy perſon. This varies conſiderably in different ſubjects, being in general greateſt in children, and leaſt in old perſons. Dr Hales eſtimated the number of 20 in a minute; the ſubject of Dr Menzies' experiments reſpired only 14 times in the ſame period, while Mr Davy reckons his reſpirations at between 26 and 27; the ſubject of the experiments made by Meſſrs Allen and Pepys, breathed about 19 times in a minute, and with this Dr Thomſon's experience agrees. The average of all theſe is about 20, which we may probably conſider as a tolerably juſt eſtimate. Much, however, will depend on the circumſtances in which the perſon is placed; on his habits of activity or idleneſs, of temperance or intemperance; on the ſtate of the atmoſphere, &c.

225
Experimental writers on reſpiration.

The chemical changes produced on the air by the reſpiration of animals have been deſcribed, ſo far as they were then known, under CHEMISTRY, N° 2536. Since that article was written, however, ſeveral valuable obſervations have been publiſhed, and the moſt important of theſe muſt be here noticed; but as we cannot, in this place, give any thing more than a ſummary ſketch of theſe obſervations, we ſhall here enumerate the principal works that have appeared on this experimental part of our ſubject. The chemical phyſiologiſts who have been moſt conſpicuous in theſe reſearches are, Mayow (in his *Tractatus de Reſpiratione*, or the *Analyſis* of his works by Beddoes); Prieſtley (*Experiments and Obſervations on Air*); Lavoiſier (*Traité Elementaire de Chimie*, *Phyſical and Chemical Eſſays*, and a work on *Atmoſpheric Air*); Goodwyn (*On the Connection of Life with Reſpiration*); Coleman (*On Suſpended Reſpiration*); Menzies (*On Reſpiration*); Spallanzani (*Memoires ſur la Reſpiration*), tranſlated into French by Senebier, and ſince into Engliſh, and *Rapports de l'Air avec les Etres Organiſés*, &c. alſo collected by Senebier); Davy (*Reſearches Philoſophical and Chemical, into the Nature of Nitrous Oxide*; Ellis (*Inquiry into the Effects produced on Atmoſpheric Air by Reſpiration*), and Allen and Pepys (*Philoſophical Tranſactions*, 1808, Part II. or *Phil. Mag.* vol. xxxii.). Moſt of the facts obſerved by theſe experimentaliſts, except thoſe of the three laſt mentioned, have been collected by Dr Boſtock, in his *Eſſay on Reſpiration*, by Dr Thomſon in his *Syſtem of Chemiſtry*, vol. v. third edition, and by Mr Johnſon in his *Animal Chemiſtry*, vol. iii.

226
Aſcertained changes on reſpired air.

The following changes produced on air that has been reſpired by warm-blooded animals, ſeem to have been fully aſcertained; viz. 1. That the reſpired air generally ſuffers a ſenſible diminution of bulk; 2. That it loſes a part of its oxygenous portion; 3. That it acquires an additional quantity of carbonic acid gas; 4. That it is charged with watery vapour. We ſhall reſume theſe facts, and conſider the additional information which has been acquired reſpecting them ſince the publication of our article CHEMISTRY.

227
Its volume ſenſibly diminiſhed.

1, *Atmoſpheric air generally ſuffers, by the reſpiration of warm-blooded animals, a ſenſible diminution in its bulk.*—The reſults of the experiments made by different chemiſts on the diminiſhed volume of reſpired air, are exceedingly various. Mr Davy makes the diminution amount to one-eighteenth † of the whole air inſpired; Lavoiſier and Goodwyn eſtimate it at no more than one-ſixtieth ‡, and Dr Boſtock ſo low as one-eightieth ||, while Crawford and ſome later experimentaliſts could perceive no diminution. Dr Thomſon ſtates the reſults of his experiments upon this ſubject to be, that in ſome caſes he could perceive no diminution at all, while in others it was perceptible. It was greateſt when the animal was taken out repeatedly during the experiment, or when he employed air purer than that of the atmoſphere. He is diſpoſed to conſider the diminution as accidental, and as owing to ſome abſorption of air, altogether independent of reſpiration, and exceedingly various in different circumſtances §. In the experiments of Meſſieurs Allen and Pepys, the general average of the deficiency in the total amount of common air inſpired, appeared to be very ſmall, amounting to about ſix parts in 1000, and they are inclined to attribute it, in a great meaſure, to the difficulty of exhauſting the lungs ſo completely after an experiment as before it *.

† *Reſearches*, p. 435.
‡ *Boſtock on Reſpiration.* p. 87.
|| *Ib.* p. 99.
§ *Syſtem of Chem*, third edit. vol. v. p. 735.
* *Philoſ. Mag.* vol. xxxii.

228
Part of its oxygen abſtracted.

2. *Atmoſpheric air, by the reſpiration of warm-blooded animals, loſes a part of its oxygen.*—From a compariſon of the experiments of Mr Davy, with thoſe made by Lavoiſier juſt before his death, Dr Thomſon eſtimates the quantity of oxygen conſumed in a minute, by reſpiration, at 31.6 cubic inches, making in 24 hours 45,504 cubic inches; and he concludes that in a day a man conſumes rather more than 25 cubic feet of oxygen, and that he renders unfit in the ſame time for ſupporting combuſtion and reſpiration, no leſs than 125 cubic feet of air †.

† *Syſtem of Chemiſtry*, vol. v. p. 736.

229
Carbonic acid gas acquired.

3. *Atmoſpheric air acquires, by reſpiration, an additional quantity of carbonic acid gas.*—The opinion of Dr Menzies, that the bulk of carbonic acid gas produced by reſpiration, is preciſely equal to that of the oxygen loſt, appears now to be fully confirmed. In Mr Davy's experiments they correſponded very nearly ‡, and in thoſe of Mr Dalton and Dr Thomſon, they correſponded exactly. The latter chemiſt found, on the whole, that the bulk of oxygen which diſappeared was ſomewhat greater than that of the carbonic acid generated; but the difference varied conſiderably, and kept pace with the diminution of the bulk of air reſpired. Hence he conſiders it as owing to the abſtraction of part of the air by ſome other way than reſpiration, and allowing for this abſtraction, he has no doubt that the bulk of the carbonic acid formed is preciſely equal to that of the oxygen that has diſappeared. He is diſpoſed to conſider the abſolute quantity of carbonic acid generated in 24 hours, as ſomething leſs than 40,000 cubic inches on an average §. The following reſults of the experiments made by Meſſieurs Allen and Pepys, as theſe were made on a large ſcale, may be conſidered as quite ſatisfactory on this head. 1. It appears that the quantity of carbonic acid gas emitted is exactly equal, bulk for bulk, to the oxygen conſumed. 2. Atmoſpheric air once entering the lungs, returns charged with from 8 to 8.5 per cent. carbonic acid gas, and when the contacts are repeated almoſt as frequently as poſſible, only 10 per cent is emitted. When the inſpirations and expirations are more rapid than uſual, a larger quantity of carbonic acid is emitted in a given time; but the proportion is nearly the ſame, or about eight

‡ *Reſearches*, p. 431.
§ *Syſtem Chem.* vol. v. p. 737.

Of Respiration.

eight per cent. The proportions of carbonic acid gas, in the first and last portions of a deep inspiration, differ as widely as from 3.5 to 9.5 per cent. 3. It appears that a middle-sized man, aged about 38 years, and whose pulse is 70 on an average, gives off 302 cubic inches of carbonic acid gas from his lungs in 11 minutes; and supposing the production uniform for 24 hours, the total quantity in that period would be 39534 cubic inches (*agreeing almost exactly with Dr Thomson's estimate*), weighing 18,683 grains, the carbone in which is 5363 grains, or rather more than 11 ounces troy; the oxygen consumed in the same time will be equal in volume to the carbonic acid gas; but it is evident, that the quantity of carbonic acid gas emitted in a given time, must depend very much upon the circumstances under which respiration is performed; and here it may be proper to notice, that all these experiments were made between breakfast and dinner. 4. A larger proportion of carbonic acid gas is formed by the human subject, from oxygen than from atmospheric air *.

230 Watery vapour required.

4. *Atmospheric air returns from the lungs charged with aqueous vapour.*—Of this circumstance there is no doubt, but the quantity of water contained in the expired air, and the sources from which it is derived, are still in dispute. Dr Thomson estimates the former at about 19 ounces per day; but he does not lay much stress on the results of his own experiments, as they were not sufficiently varied to give a fair average. As to the sources of this watery vapour, it has been generally supposed, that the water is formed in the lungs by a combination of part of the oxygen consumed with hydrogen evolved from the venous blood. This, however, is mere hypothesis. It has not been proved that hydrogen is evolved from the blood; and as the quantity of oxygen consumed appears to be taken up in forming the carbonic acid gas that is expired, there is none left to form water. No hydrogen, or any other gas, except carbonic acid and azotic gas, appear to be evolved during the process of respiration †.

231 Is azote lost?

There is another change supposed by most chemical physiologists, to be produced on the air by respiration, namely the loss of part of its azote; but this is still disputed. Dr Bostock concludes it to be probable, that a small portion of azote is lost, which he estimates on an average at $\frac{1}{100}$ of the air respired, making in 24 hours, about 4.5 ounces, or four cubic feet ‡. Mr Davy found the consumption of azote to amount to about one seventh of that of oxygen ||; and some late experiments of Dr Henderson afford a similar result, though in these the proportion is rather less §. Dr Thomson also found a loss of azote, but it was extremely inconstant, sometimes being scarcely perceptible, at others considerable. It kept pace with the diminution of the bulk of the air respired, and with the difference between the bulk of the oxygen consumed, and the carbonic acid formed. He conceives that a portion of the air respired disappears without undergoing any change, and that this portion occasions the diminution of the azote, and the difference between the bulk of the carbonic acid formed, and that of the oxygen consumed. He thinks it conceivable, that the disappearing of such a portion may be confined to the unnatural circumstances occasioned by the experiment; that the difficulty of throwing out the air from the lungs in these circumstances, may be such as to induce absorbents to act, and remove a portion which in the ordinary state of the lungs would have been thrown out by expiration *.

232 Changes on the air by the respiration of the inferior animals.

Experiments on the changes produced on atmospheric air and oxygenous gas, by the respiration of the inferior animals, have been made chiefly by Vauquelin, Spallanzani, and Mr Davy, and some of them have been repeated and varied by Mr D. Ellis. From all these experiments we find, that by the respiration of amphibia, of fishes, of insects, of mollusca, and of worms, the air in which they have been confined suffers changes analogous to those produced in it by the respiration of the warm-blooded animals; that the oxygenous part is diminished, and that this diminution is most complete when insects and worms have been confined in it; that carbonic acid gas is in all cases produced, but that the quantity produced varies in different animals; that fishes live for the shortest time, and amphibia and worms for the longest, when confined in a certain quantity.

From the latest experiments made by Spallanzani, on the effects both of living and dead animals, on atmospheric air, as collected by Senebier, that experimentalist has drawn the following conclusions. 1. In beginning with worms, and rising up to man, there is no species of animal which does not destroy the oxygen of the atmosphere after death, and destroy it entirely if it be kept inclosed in it, provided the quantity be not too great in proportion to the size of the animal; because a considerable time is required when the volume of air is large, and a less time when the quantity is small.

2. This destruction of oxygen by dead animals, is under similar circumstances slower than that effected by living animals; if we regard merely the effects produced by the cutaneous organ, independent of the action of the lungs.

3. He thought he had legitimately proved, that the destruction of oxygen by the cutaneous organ, is not occasioned by the combination of this gas with the carbone of the animal; but that it is a true absorption of that element, by the body of the animal deprived of life. It does not give out carbone, but carbonic acid, as he believed he had proved by unanswerable experiments.

4. The absorption of oxygen by animals cut into small pieces, is greater than that occasioned by animals entire in similar circumstances.

5. A cold-blooded animal of the same bulk, and in the same circumstances as a warm-blooded animal, absorbs more oxygen than the latter after death.

6. The skin is not the only part of an animal which absorbs oxygen; all the parts, solid, fluid, and soft, not excepting the driest horny parts, as the nails of quadrupeds, the bill and feet of birds, produce the same effect †.

233 Effects of vegetation on the air.

It has long been known that plants would not vegetate, if excluded from atmospheric air. Papin confined an entire plant in the exhausted receiver of an air-pump, and it soon perished; but on keeping a similar plant in this vacuum, with only its leaves exposed to the air, it continued to live for a long time ‡. When the leaves of a plant are stript off, or blighted by insects; when they have the upper surface smeared with oil, with varnish, or laid upon water §, the plant dies in a few days. Hence it is evident that the leaves of a plant are necessary organs, and that there is produced on the air in which

* Phil. Mag. vol. xxxii. p. 65.

† Phil. Mag. xxxii. p. 269.

‡ Essays on Respiration, p. 100.

|| Researches, p. 433.

§ Nichols. Jour. 8vo. vol. viii. p. 44.

* Nich. Chem. vol. v. p. 738.

† Edin. Med. Jour. vol. v. p. 109.

‡ Darwin's Phytologia, p. 51.

§ Ellis's Inquiry, p. 28.

which the plant vegetates, ſome change eſſential to the healthy action of the plant. What this change is, has not been fully aſcertained. It is the general opinion, that the leaves abſorb a portion of the atmoſphere, and give out certain gaſeous products; and it is generally believed, that moſt plants have the property of giving out oxygenous gas during their expoſure to the light, and azotic gas or ſome other irreſpirable air in the dark. That oxygenous gas is neceſſary to vegetation, is fully proved; and it ſeems certain, eſpecially from the experiments of Mr Ellis, that under the ordinary circumſtances, carbonic acid gas is generated during their vegetation *. Mr Ellis, who is not ſatisfied with the accuracy of the experiments of Scheele and Prieſtley, ſeems to doubt whether plants at any time give out oxygenous gas; and thinks that the principal uſe of oxygen to them, is to combine with the ſuperfluous carbone produced by vegetation, and thus form the carbonic acid evolved.

* *Ellis's Inquiry, p. 39. et ſeq.*

234 Effects of reſpiration on the animal ſyſtem.

Having conſidered the effects produced on the air by the reſpiration of animals, and the vegetation of plants, we muſt now notice the effects produced by the exerciſe of the ſame function on the animal body, as the compariſon of theſe effects with the changes produced on the air itſelf, affords us the only clue to a rational theory of reſpiration.

235 Changes on the blood.

We have already ſtated (Chemistry, 2540), that during reſpiration, the blood changes from the dark colour which it has in the veins, to the bright ſcarlet of arterial blood. It has been found, that a clot of venous blood, when out of the body, aſſumes the bright tinge, when expoſed to the action of oxygenous gas; and that venous blood confined within a bladder, undergoes a ſimilar change, when the bladder is immerſed in oxygenous gas. It has been alſo found, that when arterial blood out of the body is expoſed to the action of irreſpirable gaſes, it loſes its bright colour, and aſſumes the purple hue of venous blood.

236 Increaſe of temperature.

It is fully aſcertained, that the heat of the body is chiefly kept up by reſpiration. See Chemistry, N° 2545.

237 Theory of reſpiration.

Let us now conſider the moſt probable theories of reſpiration, chiefly as they are applicable to the human ſyſtem. Without ſtaying to notice the older hypotheſes that have been advanced to explain this function, we ſhall only ſtate the preſent moſt received doctrine, and mention the objections that have been lately made to it.

238 Theory of Allen and Boſtock.

This doctrine is ſtated in the following manner by Dr Boſtock, one of its moſt ſtrenuous defenders. "The blood ariſes at the right ſide of the heart, in a venalized ſtate, loaded with a quantity of the oxyde of carbone; as it paſſes through the pulmonary veſſels, it becomes ſubjected to the action of the air contained in the bronchial cells; a portion of the oxygen is removed from the air, part of which, forming an intimate union with the oxyde of carbone, is expelled in the form of carbonic acid gas, while the remainder is diſſolved in the blood." It is here neceſſary to remark, that it is not *oxygenous gas*, but *oxygen*, which is ſuppoſed to be mixed with the blood. The caloric thus ſet at liberty is employed, part of it in maintaining the temperature of the lungs, which would otherwiſe be cooled by the admiſſion of the external air; part of it in carrying off the aqueous vapour, and another portion in converting the carbonic acid into carbonic acid gas; but the greateſt part of it is united, in the form of ſpecific heat, to the arterial blood, which, by becoming arterialized, has its capacity for heat increaſed. The arterial blood is poured into the left cavity of the heart, and propelled through the arteries into the extreme parts of the body. The oxygen which was diſſolved in the whole maſs of blood, during the circulation, gradually unites itſelf more intimately to a portion of the carbone in it, which it converts into the oxide of carbone, and thus the blood acquires the venous ſtate. By this change, its capacity for caloric is diminiſhed; the ſpecific heat which it obtained in the lungs, is given out in the capillary veſſels, to keep up the temperature of the body, and the blood returns to the right ſide of the heart completely venalized. This hypotheſis is nearly ſimilar to the one which was propoſed by M. M. La Grange and Haſſenfratz; it received ſome modifications from Mr Allen of Edinburgh, and was delivered by him nearly in the form which I have ſtated above, in his admirable courſe of phyſiological lectures. It was, I believe, firſt publiſhed in my Eſſay on Reſpiration *."

* *Edin. Med. Jour.* vol. iv. p. 160.

This doctrine, if ſufficiently eſtabliſhed, would explain the manner in which the blood becomes arterialized in the courſe of the leſſer circulation. It would alſo ſhew how, under particular circumſtances, the arterial blood may be venalized without leaving the arteries, and the venous blood arterialized without leaving the veins. It accounts for the gradual evolution of caloric in the capillary veſſels, during the courſe of the circulation, by the union which takes place between the oxygen and the carbone; whereas in the other hypotheſis, (ſee N° 241.;) this union is entirely completed in the lungs. It would allow a conſiderable time in which this union might be accompliſhed, and would likewiſe ſuppoſe the conſtituent parts to remain in perfect contact for an indefinite period. This hypotheſis would alſo explain how the oxygen is diſpoſed of, which is ſuppoſed not to be concerned in the formation of carbonic acid, and would likewiſe poſſeſs the advantage of ſuppoſing the exiſtence of a ſurplus quantity of oxygen, which being carried along the circulation, might be expended in a variety of uſeful purpoſes in the different parts of the animal economy. It would ſhew how the ſupply of matter which is poured into the blood by the abſorbents, is gradually incorporated with the maſs; and after the ſeparation of that portion, which is neceſſary for repairing the waſte of the different organs, the remainder is united to oxygen, and keeps up the temperature of the body; and, having afterwards no farther uſeful purpoſe to ſerve, it is diſcharged by the lungs †.

† *Ib.* p. 167.

239 Objections.

Several objections, however, may be made to this theory. It is not proved that there is in natural reſpiration any abſorption of oxygen by the blood; for though much of the oxygenous portion of the atmoſphere is loſt, the quantity of carbonic acid generated is ſufficient to account for it. Mr Ellis has lately made very ſtrong objections to this ſuppoſed abſorption of oxygen, drawn chiefly from the anatomical ſtructure of the blood veſſels, and of the bronchial cells. He contends that the coats of the former, and the membranes bounding the latter, can ſcarcely admit the paſſage of air through them, much leſs that of the ſolid baſis of oxygenous gas, which baſis Dr Boſtock ſuppoſes to be the principle abſorbed. It is ſtill more improbable, according to Mr Ellis, that two ſolid baſes, namely thoſe of oxygenous gas, and of oxide of carbone, ſhould be at the ſame time paſſing through

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through theſe reſiſting membranes; a ſuppoſition that is neceſſary in the hypotheſis juſt ſtated. Again, ſuppoſing that this abſorption of oxygen ſhould take place, from the affinity of the blood for this principle, it is not eaſy to conceive why this affinity ſhould ſo ſoon ceaſe, and why the blood ſhould again part with the oxygen, to the baſe of carbonic oxide ‡. Theſe objections are certainly very forcible; let us ſee how they have been anſwered.

‡ Ellis's *Inquiry*, p. 117.—123.

240 anſwered.

Dr Boſtock, in an ingenious reply to Mr Ellis's objections, in invalidation of the firſt objection, quotes the well-known experiment of Dr Prieſtley, mentioned in N° 235. that venous blood becomes changed when expoſed to oxygenous gas, even though a bladder be interpoſed between them; and in controverting of the reſt, he ſeems chiefly to rely on the ſuppoſition that a greater quantity of oxygen is conſumed than is taken up in the formation of the carbonic acid. He alſo does not conſider it as *neceſſary* to ſuppoſe that either the oxygenous gas, or the oxygen itſelf, ſhould enter the blood veſſels, and ſhould afterwards be expelled from them; but only that a *part of the oxygen* ſhould be *attracted* by the blood, and after entering into a variety of new combinations, ſhould be diſcharged as a conſtituent of ſome of theſe new compounds. Without inquiring in what way the action between the blood and oxygen takes place; whether it be in conſequence of the mechanical ſtructure of the membranes, which permits the oxygen to paſs through their pores, or whether it be owing to the affinity of the blood for oxygen, which cauſes it as it were to become ſaturated with this ſubſtance before it tranſmits it; it appears to him ſufficient to ſtate, that oxygen and blood can act on each other, through a membrane which is very much thicker, and probably much denſer, than that which ſeparates the blood in the lungs from the air in the bronchial cells *.

* Edin. *Med. Jour.* vol. iv. p. 161. *et ſeq.*

241 Mr Ellis's opinion.

From a conſideration of the principal experiments on reſpiration that have been made by the ableſt chemical phyſiologiſts, and a compariſon of theſe with what he has himſelf made, Mr Ellis contends that no part of the air enters into the blood, but all the oxygen which diſappears is to be found in the carbonic acid produced; and that this carbonic acid is formed by the union of carbone emitted by the exhalant veſſels of the lungs, uniting with part of the oxygenous portion of the inſpired air †.

† *Edin. Med. Jour.* vol. iv. p. 327.

242 Objections.

To this opinion Dr Boſtock, in the paper already referred to, makes the following objections; that this opinion does not explain how the regular ſupply of carbone is, at each ſucceſſive circulation, brought to the lungs in a ſtate proper to be diſcharged; and that it does not explain in what way the oxygen is employed, which is conſumed in reſpiration ‡.

‡ *Edin. Jour.* vol. iv. p. 163.

243 anſwered.

To the firſt of theſe objections (which, if it be proved that the whole of the oxygen is taken up in forming carbonic acid, is the only objection that can properly lie againſt his opinion), Mr Ellis replies, that the ſupply of carbone is derived from the digeſtive organs; but he does not conceive, as Dr Boſtock ſeems to imagine, that this is no ſooner received into the blood than excreted, or that the firſt operation which takes place in the ſanguiferous ſyſtem after it has received the ſubſtance which is to afford nutriment to the body, is to diſcharge the greateſt part of it. He regards carbone as a conſtituent part of the animal fluids, and he has endeavoured to ſhew, that it is emitted by the exhalants of the ſkin and inteſtines, as well as by thoſe of the lungs, producing in all caſes ſimilar changes on the air. Digeſtion he holds to be in no other way the ſource of the carbone in the fluids, than as it is the ſource of all the other principles which they contain. We know that all the phenomena of reſpiration are often exhibited for long periods where no digeſtive proceſs is carried on; but the functions of life muſt ſooner or later come to an end, if the various means of exhauſtion be not recruited by ſupplies through the digeſtive organs. It is only in this diſtant view that he conſiders digeſtion as the ſource of carbone; its immediate ſources are the exhalant functions of the body, which will afford carbone as long as they are ſupported by the motion of the blood, and will no longer yield it when the motion of the blood has ceaſed. But whether the exhalant functions continue or ceaſe, he conſiders that carbone exiſts abundantly, if not equally, in the ſerum and craſſamentum, in arterial and venal blood *.

* *Edin. Jour.* vol. iv. p. 327.

244 Theory of reſpiration ſtill incomplete.

On the whole, though the final cauſes of reſpiration, or the uſes to which it is ſubſervient in the animal economy, are now pretty well underſtood, we muſt acknowledge that the mode in which theſe beneficial effects are produced, has not yet been ſatisfactorily explained.

245 Uſes of reſpiration.

The principal uſes of reſpiration appear to be, 1. To bring about ſome beneficial change in the fluids of the body, and through them on the ſolids; 2. To preſerve the equable temperature of the body; and, 3. In all thoſe animals that breathe by lungs to produce thoſe ſounds which ariſe from what we call *voice*.

246 Animal heat.

That animal heat is kept up chiefly by reſpiration, requires we think, no particular proof. It is well known, that thoſe animals which conſume moſt air during reſpiration, have the higheſt temperature. Birds in particular have the moſt extenſive breathing organs, and the temperature of theſe animals is higher than that of any other claſs. The reſpiration of reptiles, fiſhes, and moſt of the lower claſſes, is ſlow and languid, and the temperature of theſe animals is proportionally low. The heat of each ſpecies is, however, pretty uniform under ordinary circumſtances. That of the human body is generally about 98° of Fahrenheit. This however depends on the circumſtances in which it is placed. When much chilled by the action of cold, the temperature of the human body falls a degree or two below the ordinary height; and under the influence of violent fever, it riſes ſeveral degrees above it. The temperature is generally higheſt in children; and inſtances are recorded of theſe having ſurvived, while their mothers, to whoſe breaſts they clung, have periſhed from the ſeverity of cold.

247 Preſervation of equable temperature.

One of the moſt intereſting facts relating to the ſubject of animal heat, is the capacity of preſerving the equable temperature of their bodies, poſſeſſed by moſt animals. Man himſelf can live with little inconvenience in the frozen regions of Spitzbergen, and under the equatorial heats of Africa. He can even ſupport a greater degree of heat than is perhaps ever known to take place from the rays of the ſun, as is proved by the experiment of Drs Blagden and Fordyce in heated rooms; theſe gentlemen having remained for 15 minutes together in a heat exceeding 130°. The heat ſupported by ſome of the inferior animals is ſtill more extraordinary. A dog has been known to live for a conſiderable time in air heated to 260°, and ſtill the heat of his body was not raiſed more than 2° above its natural ſtandard. A frog has lived for more than 25 minutes when laid on flannel,

nel, heated from 95° to 106°. Fiſhes live very well at 7[illegible]°; and Lucas, in his hiſtory of mineral waters, ſpeaks of carp that were living in a hot bath, whoſe temperature was at leaſt equal to that of the human body.

How this equable temperature is preſerved, cannot be completely explained. We know that the heat of the human body is commonly moderated by perſpiration; but in ſome caſes, as in that of Dr Fordyce alluded to above, where the heated atmoſphere was filled with watery vapour, this could have little effect. We can aſcribe it only to the action of the living principle.

248 **Voice.**

It was long ago obſerved by Ariſtotle, that thoſe animals only who poſſeſs lungs, have a true voice, and this opinion is confirmed by the experience of modern naturaliſts. We find, that only mammalia, cetacea, birds, reptiles and ſerpents, can utter vocal ſounds. Several tribes below theſe do indeed emit certain ſounds, eſpecially inſects; but theſe are owing to vibrations of the air in conſequence of the agitation of their external organs. It is only in mammalia and birds that the voice becomes an intereſting object of enquiry; for that of the cetacea is little more than blowing and grunting, and that of the other two claſſes is either hiſſing or croaking.

249 **Amazing variety of the human voice.**

Nothing can exceed, in variety and execution, the human voice; as will readily be allowed, if we conſider the complicated ſtructure of the human vocal organs, and the almoſt infinite variety of changes of which they are ſuſceptible. Dr Barclay has calculated theſe with great accuracy, proceeding on the principle, that where a number of moveable parts conſtitutes an organ deſtined to ſome particular function, and where this function is varied and modified by every change in the relative ſituation of the moveable parts, the number of changes produceable on the organ muſt at leaſt equal the number of muſcles employed, together with all the combinations into which they can enter. Now, the muſcles proper to the five cartilages of the larynx, are at leaſt ſeven pairs; and fourteen muſcles that can act ſeparately or in pairs, in combination with the whole, or with any two or more of the reſt, are capable of producing 16,383 different movements; not reckoning as changes the various degrees of force and velocity, nor the infinitely varied order of ſucceſſion by which they may occaſionally be brought into action. The number appears almoſt incredible; but to leſſen the ſurpriſe, it muſt be recollected that we ſpeak not here of the powers poſſeſſed by any individual, which will depend on habits and circumſtances, but of the powers of the vocal organs, conſidered in the abſtract, free from all the influence of cuſtom, equally indifferent, and equally diſpoſed to act in any order of ſucceſſion, in any combination, and with any degree of force and velocity of which their original powers were ſuſceptible.

If the powers we have mentioned appear aſtoniſhing, and able to account for many thouſands of theſe varieties obſerved among the voices of the human ſpecies, we have further to add, that the muſcles alluded to are only the proper muſcles of the *larynx*, or the muſcles reſtricted in their attachments to its five cartilages. Theſe are but a few of the muſcles of voice. In ſpeaking we uſe a great many more. Fifteen pairs of different muſcles, attached to the cartilages, or *os hyoides*, and acting as agents, antagoniſts, or directors, are conſtantly employed in preſerving the cartilages of the larynx ſteady, in regulating the place of their ſituation, or moving them as occaſion requires, upwards and downwards, backwards and forwards, and in every way, directly and obliquely, according to the courſe of the muſcular fibres, or in the diagonal between different forces. Theſe muſcles, independent of the former, are ſuſceptible of 1,073,741,823 different combinations; and co-operating with the ſeven pairs of the larynx, of 17,592,186,044,415, excluſive of the changes which muſt ariſe from the different degrees of force and velocity, and the infinitely varied order of ſucceſſion in which they may be brought into action.

But theſe are not all that co-operate with the larynx, either in forming or changing the voice; the diaphragm, the abdominal muſcles, the intercoſtals, and all that directly or indirectly act on the air, or on the parts to which the chondral and hyoidal muſcles are attached, contribute their ſhare. The *os hyoides* could not be raiſed unleſs the inferior jaw-bone were previouſly fixed by the *temporals*, *maſſeters*, and internal *pterygoids*; and a ſimilar aſſiſtance is likewiſe furniſhed by ſeveral other auxiliary muſcles that fix the head, *ſternum*, and *ſcapula*; to theſe we muſt add ſome pairs belonging to the *pharynx* and *iſthmus faucium*, and ſome alſo belonging to the tongue, which, combining with others, give to that organ an inconceivable variety of movement; and ſo quickly, that, in rapid utterance, they change its ſtate 3000 times in a minute. Thus Haller could articulate 1500 letters in a minute, which required 1500 contractions, and as many relaxations of the lingual muſcles †.

† *Barclay's Anat. Nomen.* p. 70.

250 **Mechaniſm of voice and ſpeech.**

The principal organ of voice is the larynx, which is proved by the circumſtance that, when this is injured, the voice is either loſt, or rendered very indiſtinct. In ordinary reſpiration the chink of the glottis ſeems to be in a relaxed ſtate, and when this chink is contracted, voice is produced, and the ſound of the voice is more or leſs ſhrill, according as the *glottis* is more or leſs contracted. By this contraction of the glottis alone we can produce only inarticulate ſounds, varied indeed almoſt infinitely with reſpect to intenſity and tone, by the action of the muſcles. The production of ſpeech requires the action of the tongue, the lips, the palate, and the teeth; and the articulations are moſt complete, when all theſe parts are moſt perfect in their ſtructure, and in the moſt healthy condition. Too great length or ſhortneſs of the tongue, ſwelling of this organ in conſequence of inflammation, &c. imperfection of the palate, loſs of the teeth, ſwelling of the lips, all ſerve to render ſpeech imperfect and inarticulate. The ſtrength of the voice depends on the quantity of air expired, and on the contraction of the glottis; and conſequently thoſe animals who have the moſt capacious and moſt dilatable lungs, together with an ample cartilaginous and elaſtic larynx, will, other things being equal, have the ſtrongeſt voice.

251 **Ventriloquiſm.**

Among the various effects of the human voice, there is none more calculated to produce ſurpriſe in the hearers, than that extraordinary talent which ſome men poſſeſs of deceiving their hearers into a belief, that the ſounds which they utter do not proceed from the real ſpeaker, but from ſituations at a diſtance. This talent has been termed *ventriloquiſm*, from an idea that the voice of the ſpeaker proceeded not from the mouth, but from the belly. The moſt remarkable inſtance of this rare talent of which we have heard, is that of M. Fitz-James, who was formerly at Paris, and exhibited in London in the year 1803. Mr Nicholſon has given an amuſing,

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amusing account of the performance of this ventriloquist, and we shall present part of it to our readers.

After some remarks on the nature of ventriloquism, which we shall notice presently, and on the difficulty of ascertaining the direction of the sound, Mr Nicholson thus proceeds :—" We should scarcely be disposed to ascribe any definite direction to it ; and consequently are readily led to suppose it to come from the place best adapted to what was said. So that when he went to the door, and asked in French (in which the whole performance was carried on), ' are you there ?' ' to a person supposed to be in the passage, the answer in the unusual voice was immediately ascribed by the audience to a person actually in the passage ; and upon shutting the door and withdrawing from it, when he turned round, directing his voice to the door, and said, ' stay there till I call you,' the answer which was lower, and well adapted to the supposed distance, and obstacle interposed, appeared still more strikingly to be out of the room. He then looked up to the ceiling and called out in his own voice, ' what are you doing above ?' ' do you intend to come down ?' to which an immediate answer was given, which seemed to be in the room above, ' I am coming down directly.' The same deception was practised on the supposition of a person being under the floor, who answered in the unusual, but a very different voice from the other, that he was down in the cellar putting away some wine. An excellent deception of the watchman crying the hour in the street, and approaching nearer the house, till he came opposite the window, was practised. Our attention was directed to the street by the marked attention which Fitz-James himself appeared to pay to the sound. He threw up the sash and asked the hour, which was immediately answered in the same tone, but clearer and louder ; but on his shutting the window down again, the watchman proceeded less audibly, and all at once the voice became very faint, and Fitz-James in his natural voice said, ' he has turned the corner.' In all these instances as well as others which were exhibited to the very great entertainment and surprise of the audience, the acute observer will perceive that the direction of the sound was imaginary, and arose entirely from the well-studied and skilful combinations of the performer. Other scenes which were to follow required the imagination to be too completely misled to admit of the actor being seen. He went behind a folding screen in one corner of the room, when he counterfeited the knocking at a door. One person called from within, and was answered by a different person from without, who was admitted, and we found from the conversation of the parties, that the latter was in pain, and desirous of having a tooth extracted. The dialogue, and all the particulars of the operation that followed, would require a long discourse if I were to attempt to describe them to the reader. The imitation of the natural and modulated voice of the operator, encouraging, soothing, and talking with the patient ; the confusion, terror, and apprehension of the sufferer ; the inarticulate noises produced by the chairs and apparatus, upon the whole, constituted a mass of sound which produced a strange but comic effect. Some observers would not have hesitated to assert, that they heard more than one voice at a time ; and though this certainly could not be the case, and it did not appear so to me, yet the transitions were so instantaneous, without the least pause between them, that the notion might very easily be generated. The removal of the screen satisfied the audience that one performer had effected the whole.

" His principal performance, however, consisted in the debates at the meeting of *Nanterre*, in which there were twenty different speakers, and certainly the number of different voices was very great. Much entertainment was afforded by the subject, which was taken from the late times of anarchy and convulsion in France ; when the lowest, the most ignorant part of society, was called upon to decide the fate of a whole people by the energies of folly and brute violence. The same remark may be applied to this debate, as to the other scene respecting tooth-drawing ; namely, that the quick and sudden transitions, and the great differences in the voices, gave the audience various notions, as well with regard to the number of speakers, as to their positions and the direction of their voices *."

252

How explained.

Various explanations of this peculiar modification of voice have been given. From the report of Fitz-James himself, it appeared to Mr Nicholson, that by long practice he had acquired the faculty of speaking during the inspiration of the breath, with nearly the same articulation, though not so loud, nor so variously modulated, as the ordinary voice, formed by expiration of the air. M. Richerand, who heard Fitz-James at Paris, gives a different account of the matter. He says that every time the ventriloquist exerted this unusual peculiarity, he suffered distention in the epigastric region ; that sometimes he perceived the wind rolling even lower, and that he could not long continue the exertion without fatigue. Richerand believes that the whole mechanism of this art consists in a slow, gradual expiration, drawn in such a way, that the artist either makes use of the influence exerted by volition over the muscles of the parietes of the thorax, or that he keeps the epiglottis down by the base of the tongue, the apex of which is not carried beyond the dental arches.

He always made a strong inspiration just before this long expiration, and thus conveyed into the lungs a considerable mass of air, the exit of which he afterwards managed with such address. Therefore repletion of the stomach greatly incommoded the talent of M. Fitz-James, by preventing the diaphragm from descending sufficiently to admit of a dilatation of the thorax, in proportion to the quantity of air that the lungs should receive. By accelerating or retarding the exit of the air, he can imitate different voices, and induce his auditors to a belief, that the interlocutors of a dialogue kept up by himself alone, are placed at different distances †.

Mr Gough in an ingenious paper, containing an investigation of the method whereby men judge, by the ear, of the position of sonorous bodies, relative to their own persons, explains the phenomena of *ventriloquism*, on the principles of reverberated sound, and considers it as consisting in the talent of making the voice issue only from the mouth ; whereas he thinks that in ordinary cases the different vibrations which are excited by the joint functions of the several vocal organs in action, pass along the bones and cartilages from the parts in motion, to the external teguments of the head, face, neck, and chest, from which a succession of similar vibrations is imparted to the contiguous air, thereby converting the upper half of the speaker's body into an extensive seat of sound. He thinks that the sounds proceeding from the mouth

* *Philos. Jour.* 8vo. vol. iv. p. 203.

† *Richerand's Physiol. by Kerrison*, p. 376.

mouth of a ventriloquiſt are uttered in ſuch a direction that the hearers may receive the impreſſion of ſome echo with much more force than they can receive the original ſounds *. It may be doubted whether ſuch echoes can take place in an ordinary room filled with a large aſſembly; and on the whole we are inclined to conſider this phenomenon as being effected partly by the gradual emiſſion and a ſkilful management of a large quantity of air taken in by a full inſpiration, and partly by the influence which the performer is capable of exerting over the imagination of his hearers.

* *Mancheſter Memoirs*, vol. v. part ii. p. 622.

253
Voice of brutes.

Several of the mammalia have a characteriſtic voice, which is formed by particular organs. Theſe are in ſome animals tenſe membranes; in others peculiar cavities opening into the larynx, and ſometimes appearing like continuations of the laryngeal ventricles. Thus the neighing of the horſe is effected by a delicate, and nearly falciform, membrane, which is attached by its middle to the thyroid cartilage, and has its extremities running along the outer margins of the opening of the glottis. The braying of the aſs is produced by means of a ſimilar membrane, under which there is an excavation in the thyroid cartilage. In this animal there are alſo two large membranous ſacs opening into the larynx. The purring of the cat ſeems to be owing to two delicate membranes that lie below the ligaments of the glottis. Some of the monkey tribe, eſpecially the *ſimia ſeniculus* and beelzebul, have the middle and fore part of the *os hyoides* formed into a ſpherical bony cavity, by which theſe animals are enabled to produce thoſe horrible and penetrating tones, which can be heard at vaſt diſtances, and have gained them the name of howling apes †. See Mammalia, N° 33.

† *Blumenbach's Comp. Anat.* chap. xv.

254
Voice of birds.

The ſimpleſt vocal organ ſeems to be that of birds. Theſe animals have, on the ſides of the windpipe next the lungs, and at the opening of the bronchiæ, two membranous folds which partly cloſe the pulmonary aperture of the windpipe, and the aperture next the head is ſuſceptible of great contraction and dilatation. In ſhort, the vocal organ of birds may be conſidered as one of the moſt perfect wind inſtruments, very much reſembling, both in its ſtructure and effect, a clarinet or hautboy, the opening next the lungs being ſimilar to the reed of theſe inſtruments. For ſome remarks on the ſong of birds, ſee Ornithology, N° 42; and for farther obſervations on the voice, ſee Anatomy, Part I. N° 122.

255
Relations of reſpiration with other functions.

In tracing the relations of reſpiration with the preceding functions, we muſt deviate a little from our uſual order, and begin with thoſe between reſpiration and *circulation*, as it ſeems to be through the medium of the circulating ſyſtem that reſpiration principally acts on the other functions. The relations between reſpiration and circulation are the moſt immediate and the moſt obvious.

256
With circulation.

When the *breathing* is moſt free and rapid, the circulation is moſt vigorous and active; while in laborious or interrupted reſpiration, the action of the heart and arteries becomes ſlow, feeble, irregular; and where the lungs are deprived of oxygenous gas, the *arteries* gradually ceaſe to pulſate, and ſoon after the motion of the *heart* ceaſes. If the ſtimulus of oxygen be not too long withheld, ſo that the lungs can again be excited to action, firſt the heart, and then the arteries, gradually renew the exerciſe of their functions, and the circulation proceeds as before. On the application of theſe principles depends the recovery of thoſe apparently dead from *aſphyxia* (ſuffocation, drowning, &c.). When the circulation becomes languid from indolence, from depreſſing paſſions, or the want of accuſtomed ſtimuli, we feel about the breaſt a peculiar ſenſation, which phyſicians call *anxiety*, and which is relieved by a deep inſpiration; by ſighing, yawning, &c. Violent exertions of the reſpiratory organs, ſuch as laughing, coughing, ſinging, talking unuſually long or loudly, quicken the circulation, ſometimes to an alarming degree, ſo as to occaſion hæmorrhage in ſuch as are prediſpoſed to that affection. Breathing in an atmoſphere that is much rarefied, as on the top of a high mountain, has often the effect of producing plethora and hæmorrhage; though this, perhaps, is imputable rather to a want of the ordinary preſſure on the ſurface of the body.

257
With ſenſation.

When the circulation through the lungs is impeded or obſtructed, a determination of blood takes place to other parts, eſpecially to the head. The effects produced on the brain and other organs of ſenſation, by the breathing of impure air, are dreadful. When the ſame quantity of air is repeatedly reſpired, there is experienced, firſt, great anxiety about the breaſt, and this ſoon becomes intolerable; the face ſwells, becomes livid, or even black, and feels exceſſively hot; ſparks of fire ſeem to dance before the eyes; the ſight becomes depraved; giddineſs, ringing in the ears, and confuſion of thought ſucceed; and if freſh air be not ſoon ſupplied, the ſubject of the experiment loſes both ſenſation and motion, and falls into a ſtate reſembling apoplexy †. When rarefied air is breathed, the nervous ſyſtem experiences a kind of excitement; agreeable ſenſations are produced, with a diſpoſition to mirth and cheerfulneſs; but if the perſon continue for ſome time in ſuch a ſituation, an unuſual languor, heavineſs, and diſpoſition to ſleep, come on ‡. We need not here deſcribe the pleaſurable ſenſations excited by the reſpiration of nitrous oxide, as theſe have been already related under Chemiſtry, N° 366. The exhilarating effects which a pure and ſerene atmoſphere produce on the general ſyſtem, and the uneaſy ſenſations experienced under a thick and clouded ſky, are partly referable to this head. The nervous ſyſtem alſo acts on the organs of reſpiration. In ſome affections of the brain, reſpiration is much quickened, while in others, eſpecially the comatoſe affections, it is ſlow, laborious, and often attended with that peculiar noiſe called *ſtertor*. It is well known what effect anxiety, eagerneſs, hope, or deſire, have on the reſpiration. According as one or other of theſe paſſions is predominant, the breathing becomes hurried, irregular, or ſuſpended.

† *Kite's Eſſay on Apparent Death*, p. 25.

‡ *Sauſſure Voyage dans les Alpes*, p. 559.

258
With motion;

An evident relation takes place between reſpiration and motion. The breathing is quickened by exerciſe; and when there is a conſiderable debility of the muſcular ſyſtem, the ſlighteſt exertion produces hurried reſpiration, panting, &c. In thoſe animals that poſſeſs the greateſt powers of motion, reſpiration is moſt free, and the air moſt extenſively diffuſed over the body. In birds, not only the lungs are very extenſive, but the air is conveyed into the bones of the ſkull, and into the hollows of the larger cylindrical bones; and in inſects which have the moſt rapid motions, the air penetrates to every part of the body. Motion, as well as ſenſation, becomes unuſually free and vigorous in rarefied air, and during the reſpiration of nitrous oxide; while in caſes of

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of impeded or obstructed respiration, the action of the muscles is languid and feeble. Indeed, if we may implicitly rely on the experiments that have been made on the respiration of de-oxygenated gases, the muscular fibres are among the first organs that are injured. We are told that by the admission of black blood, or blood that has not undergone the necessary changes by healthy respiration, the muscles lose their power of contraction, and even their irritability.

259 With digestion.

The organs and function of respiration sympathise with those of digestion. When the former function is most free, the latter is generally most healthy; the respiration of pure or rarefied air, or of the nitrous oxide, is attended with an increase of appetite, and of the digestive powers, as was experienced by M. Saussure while wandering among the Alps, and by Davy while respiring the *gas of Paradise*. Again, when digestion is impaired, or when the stomach is overloaded, the breathing is rendered difficult, laborious, or irregular, and in many cases of affection of the stomach, cough is a very common symptom. These effects produced on the respiratory organs in consequence of impaired digestion, are ascribable chiefly to the pressure on the diaphragm by the distended stomach.

Many other relations might be pointed out between respiration and the other functions of the animal economy, but our limits do not permit us to enlarge further on the subject *.

For an account of the morbid affections of respiration, such as *freezing, hiccup, coughing, anxiety, dyspnœa*, or *difficulty of breathing*, see the article MEDICINE.

* See *Bichat Recherches Physiol. sur la Vie et la Mort.*

CHAP. IX. *Of Nutrition and Assimilation.*

260 Nature of nutrition.

THE function by which the nutritious particles received by a living being are assimilated to the nature of that being, or become part of its substance, is properly called *nutrition*. This is the completion of the process which, in most animals, is the combined result of several other operations. Thus, in the superior animals, from man to the mollusca, the whole process of nutrition consists of *digestion, absorption, circulation*, and *respiration*; by the two last of which the nourishment received is changed into perfect blood, and fitted for the support and renewal of the several parts of the system. From the account of the constituent parts of the blood given under CHEMISTRY, N° 2660, it will appear, that this fluid contains within itself the principles of which every part of the body is composed. Thus it contains *fibrine*, which is the chief principle of the muscular parts; *phosphate of lime*, which forms the basis of the bones; *albumen* and *gelatine*, the chief constituents of cartilages, ligaments and tendons, &c. These principles are conveyed by the arterial blood, during its circulation, to those parts of the system where they are required, for renewing waste, or supplying deficiencies, and thus they are assimilated to the nature of the body.

261 Each assimilating organ produces peculiar changes.

The power of assimilation, so remarkable in living bodies, is not the same in every assimilating organ; but each has the property of converting the materials it receives (provided they be susceptible of this conversion) into a peculiar substance. Thus, the stomach always converts the food into *chyme*; the intestines change it into *chyle*; but if chyle, or what is very similar to it, fresh milk, be received into the stomach, this organ exerts on it the usual change, and does not pass it forward into the intestines unaltered, though we know by experiment, that fresh milk is capable of being taken up unchanged by the absorbents of the bowels *. Again, blood is always perfected within the circulating vessels; and if chyle or fresh milk be injected into the arteries, it produces dangerous effects, while the fresh blood of another living animal may be transfused into these vessels without injury. In like manner, if a piece of fresh muscular flesh be cut from a living animal, and applied to the muscles of another living animal, also newly divided, the two parts unite, and are immediately assimilated; and even fresh bone may, in the same manner be ingrafted on the living bones of the same, or of a different species of animal †; while substances that are foreign to the nature of the animal body, when introduced into the blood-vessels, prove fatal, and when inserted into a wounded muscular or bony part, prevent the wound from healing.

Of Nutrition and Assimilation.

* *Fordyce on Digestion*, p. 189.

† *Phil. Mag.* vi. 308.

262 Assimilation a chemical process.

These circumstances show that assimilation is a chemical process, though modified and regulated by the action of the living principle. The chemical nature of assimilation is most distinctly proved by the well-known experiment of colouring the bones of an animal, by feeding it on madder. The particles of the madder, which we know to have a strong affinity for phosphate of lime, are carried unchanged from the stomach into the blood-vessels, and are thence conveyed, probably in combination with the phosphate of lime there contained, into the substance of the bones, where they are deposited, and remain for a considerable time.

263 Nutrition not performed by nerves.

We have considered nutrition as performed by the circulating vessels. It has been supposed that the nerves are the organs of nutrition; but this strange hypothesis is completely overturned by an experiment of the second Monro, which proves that the limb of a frog may be preserved alive and nourished by the blood-vessels, after its communication with the brain has been cut off by dividing the nerves.

264 Nutrition in insects and zoophytes.

In insects and zoophytes, where there are no circulating vessels, nutrition must be a very simple operation. According to Cuvier, it is performed by *imbibition*; the pores of the animal's body receiving immediately the nutritious fluids on which it feeds.

265 Assimilating power limited.

In plants and animals, the assimilating power has always certain limits prescribed to it; its influence is very generally confined to the sort of food congenial to the species, and its strength is varied according to circumstances, as the age, the habits, and the state of health. Those which are young assimilate faster than those which are old; and one species, which may partly be owing to the nature of their food, will assimilate much faster than another. Certain worms that feed on animal and vegetable substances will, in twenty-four hours after their escape from the egg, become not only double their former size, but will weigh, according to Redi, from 155 to 210 times more than before. Most oils are of very difficult assimilation; and those which are *volatile* will often resist the long-continued and the varied action of the living organs; will mingle with the parts, and, undecomposed, communicate their flavour.

Other circumstances respecting nutrition have been noticed

Of Secretion. noticed in the firſt part of ANATOMY, N° 130; and the chemical doctrine of aſſimilation is more fully conſidered under CHEMISTRY, N° 2567—2571.

CHAP. X. *Of Secretion.*

266 Secretion. THAT function by which any organ, or ſet of organs, ſeparates from the general maſs of blood certain principles intended to perform ſome important office in the animal economy, is called *ſecretion*; and the ſubſtances ſo ſeparated, are called *ſecretions*.

267 Organs. The ſecretory organs in the more perfect animals are very numerous, and ſome of them very complex. The moſt ſimple of them ſeem to be the *cellular texture*, and the *mucous membranes*. The next in ſimplicity are the *conglobate glands*, and perhaps the *ſpleen*, while the more complex organs are the *liver*, the *teſticles*, the *atrabiliary capſules*, &c. An account of all theſe organs, as they occur in the human body, has been given in the firſt part of the article ANATOMY; and the correſponding organs of the inferior animals, with others not found in man, are deſcribed by writers on comparative anatomy, eſpecially Cuvier and Blumenbach.

268 Kinds of ſecretion. Secretion appears to be of three kinds: 1. *Tranſudation*, in which the ſecreted matters merely ooze through the pores of the ſecreting organ. This takes place in the loweſt claſſes of animals, as in zoophytes, inſects, and ſome worms, but rarely in the human ſubject. 2. *Exhalation*, in which the ſecreted fluids are poured out into cavities by certain branches of the arteries with open mouths, called *exhalants*. This appears to take place in many organs of the moſt perfect animals, eſpecially from the mucous membranes, the ſynovial glands, &c. 3. *Secretion*, properly ſo called, in which the blood paſſes through glandular bodies, where a part of it is decompoſed, and carried out in another form by particular tubes called *excretory ducts*. This is the caſe with moſt of the ſecreting organs, as the ſalivary glands, the lachrymal glands, the liver, the pancreas, the teſticles, and a few others.

269 Secreted matters. The ſecreted fluids are chiefly the following: *lymph*, *ſerum*, *tears*, *mucus*, *ſaliva*, *pancreatic juice*, *gaſtric juice*, *enteric juice*, *bile*, *ſemen*, *ſynovia*, *fat*, *marrow*, *cerumen* or *ear-wax*, and in the female, *milk*. The other matters ſecreted, which may rather be termed ſolid than fluid, are *albumen*, *gelatine*, *fibrine*, and *phoſphate of lime*. On the nature and properties of all theſe ſubſtances, ſee the article CHEMISTRY, Chap. xix. ſect. 3.

With reſpect to the ſecretions in general, we may remark, that they are conſiderably influenced by age, ſex,

270 General modifications of ſecretion. various affections of the mind, and various bodily diſeaſes. They are formed by organs which are ſometimes capable of ſupplying the deficiencies of each other; they are ſubjected to the influence of the atmoſphere, and to the temperaments of the body; they are ſometimes mixed together, and by this combination their nature is changed.

We ſhall now briefly examine the action of three of the ſecreting organs, viz. the *cellular membrane*, the *liver*, and the *ſpleen*.

271 Action of the cellular membrane. From the extenſive diſtribution of the cellular membrane it is reaſonable to conclude, that it is intended to perform ſeveral important offices in the animal economy. One of its moſt obvious uſes is to form a general connecting medium between every part of the ſtructure, while it at the ſame time ſeparates and diſtinguiſhes every organ. From its elaſticity, and the lubricating fluid which it holds within its cells, it facilitates motion, and thus aſſiſts the action of all the muſcular parts and organs. That it is ſuſceptible of great dilatation is proved by the phenomena of anaſarcous dropſy; and the gradual evacuation of the water when anaſarcous limbs are punctured, as well as the paſſage of extraneous bodies below the ſkin from one part to another, ſeem to ſhow that it poſſeſſes conſiderable contractile powers. It is chiefly, however, as a *ſecreting* organ that we are here to conſider the *cellular membrane*; and in this way its function is of the utmoſt importance. The *fatty matter*, that is ſo copious in moſt of the ſuperior animals, is contained within particular cells or *bags* of the cellular membrane, and is found in greateſt quantities below the ſkin, eſpecially on the *ſternal* part of the belly, and about the kidneys. In ſome animals, as the *hog*, the *ſeal*, the *walrus* and the *cetaceous* tribes, it forms a layer ſeveral inches in thickneſs, and in all the water animals above mentioned it is nearly fluid. To theſe animals it not only ſerves the purpoſes of a warm covering by the ſlowneſs with which it conducts heat; but, by diminiſhing their ſpecific gravity, renders their motions on the ſurface of the water much more eaſy and expeditious. One of the moſt important uſes of the fat ſeems to be to ſupply nouriſhment to the body, when the ordinary channel is obſtructed, or the ſyſtem rendered incapable, from torpor or diſeaſe, of receiving food. When fat perſons are attacked by fever, or ſimilar acute diſeaſes, they become emaciated, ſometimes to ſo great a degree, as to appear a mere ſkeleton; and thoſe animals who ſleep during winter, though very fat when they retire to their dormitories, are extremely lank and lean when they quit theſe on the return of ſpring. In all theſe caſes the fat alone is abſorbed, and ſupplies the waſte that takes place in the body, and would otherwiſe prove fatal.

On the actions of the cellular membrane, ſee Bichat, *Anatomie Generale*, tom. i.

Some phyſiologiſts have ſuppoſed that the bile ſecreted by the liver is not formed entirely from the blood of the *vena portarum*, but partly from the hepatic artery. 272 Action of the liver. Dr Saunders, who has examined the arguments in favour of this ſuppoſition, decides againſt it, and conſiders the uſual opinion of the bile being ſolely ſecreted from the blood of the *vena portarum*, as quite ſatisfactory. It has alſo been ſuppoſed, that the whole of the bile is not ſecreted by the liver, but that the gall bladder has a ſhare in this office, and is not merely a reſervoir, like the urinary bladder. This ſuppoſition is highly improbable, although we think there can be little doubt that the bile undergoes, within the gall bladder, ſome peculiar changes, which render it better fitted for the functions it has to perform. We know that the gall bladder is very muſcular, and that there is an appearance of follicles within it. It is therefore probable that ſome matter is ſecreted from its internal ſurface, which produces a neceſſary change in the bile.

The principal uſe of the bile ſeems to be to ſtimulate the inteſtines, and thus keep up their energy and periſtaltic motion, though it is probable that, beſides this 273 Uſes of the bile. office, it performs ſeveral others of importance in the animal economy, ſuch as aſſiſting in the decompoſition of the food, and thus forming chyle; and acting as a

Of Secretion.

general ſtimulus to the ſyſtem. That it has this laſt effect is probable from the torpor, inactivity, and dejection that attend hypochondriacal and chlorotic affections, in which this ſecretion is defective. Too great a ſecretion, or rather excretion of bile, is attended with violent purging *.

On the nature of the bile, and biliary concretions, ſee CHEMISTRY, N° 2664.

274
Uſes of the ſpleen.

Few ſubjects in phyſiology have given riſe to more diſcuſſion, and few have been conſidered with ſo little ſucceſs, as the uſe of the ſpleen in the animal economy. That an organ ſo large, and ſo well ſupplied with blood, ſhould be intended for ſome important function, is ſcarcely to be doubted; and yet the inſtances of animals that have lived, ſeemingly with little inconvenience, after the ſpleen had been cut out, ſeem to prove that this organ is not of ſuch great importance as it appears to be. The conjectures reſpecting its uſes are various, and ſome of them not a little ludicrous. Some have ſuppoſed that it acted by its weight and preſſure on the ſtomach, and thus promoted digeſtion at one time, and counteracted hunger at another; ſome, that it was intended to dilute and attenuate the blood; others, to deprive that fluid of its ſuperabundant oil; another party, that it contributed to form the red globules of the blood; and ſome of the older phyſiologiſts ſuppoſed that it ſecreted that fluid to which they gave the name of *black bile*.

275
Opinion of Dumas.

Dumas is of opinion that it is a ſort of ſupplementary organ, both to the liver and the kidneys, ſeparating from the blood part of its ſeroſity, and then delivering it over to the liver in a proper ſtate for the formation of bile; and furniſhing to the kidneys another portion of ſeroſity to form the watery part of the urine *. That at leaſt a part of theſe opinions of Dumas has ſome foundation, will appear from the following ſummary of the late experiments of Mr Everard Home.

276
Experiments of Mr Home.

Proſecuting the inquiry reſpecting the ſtate of the ſtomach during digeſtion, which we have formerly alluded to (ſee N° 161), Mr Home found that during digeſtion, the fluids taken into the ſtomach are principally contained in the cardiac portion; and he inferred, from the uniform conſiſtence of the chyme in the pyloric portion, that a great part of the fluids are carried out of the ſtomach without ever reaching the *pylorus*. As he conceived very naturally, that the lymphatics of the ſtomach were inadequate to this office, he conjectured that the fluids might paſs off by the ſpleen. He proved, by a deciſive experiment, that liquors might paſs through the ſtomach without going through the pylorus, and he alſo found at the ſame time, that the ſpleen was turgid, unuſually large, and its external ſurface very irregular; and when cut into, ſmall cells were every where met with, containing a watery fluid, and occupying a conſiderable portion of its ſubſtance. Rudiments of theſe cells had been ſeen before by Malpighi, who conſidered them to be glands, and by Cuvier, who calls them corpuſcles; but the cells in a diſtended ſtate ſeem not to have been examined till Mr Home was led to look for them, in conſequence of the above experiment. Mr Home varied this experiment, by giving animals a decoction of madder, and an infuſion of rhubarb, and obtained ſimilar reſults. Part of the fluid ſwallowed was again rejected by vomiting; but of that which remained it was always found that a part had eſcaped, without any poſſibility of paſſing by the *pylorus*, as this was ſecured by ligature. It did not probably eſcape by the abſorbents, as theſe were not ſo much diſtended by fluid as to be viſible; and it certainly did enter the ſpleen, as there was there found a quantity of liquor, which was proved, by an alkaline teſt, to contain rhubarb. A large quantity of urine was found in the bladder, alſo impregnated with rhubarb *.

277
Spleen carries off fluid from the ſtomach.

From theſe experiments it appears, that the ſpleen is capable of carrying off from the ſtomach, a part of its fluid contents, thus affording a much nearer paſſage to the bladder than through the abſorbents. If this inveſtigation, on further trials, ſhall prove equally ſatisfactory, it will explain why the bladder is often diſtended with urine in a ſhort time after drinking; and will do away the neceſſity of having recourſe to the diſputed hypotheſis of the retrograde action of the abſorbents.

278
Peculiar animal ſecretions.

In the inferior claſſes of animals there are a number of peculiar ſecretions, which, from their utility in medicine or the arts, or from their noxious or unpleaſant effects, are deſerving the attention of phyſiologiſts. We can here only mention a few of the more important. The nature and properties of moſt of them are explained under CHEMISTRY.

Some of the mammalia ſecrete matters that have a very ſtrong ſmell, as *muſk*, *civet*, *caſtor*, and in particular the fluid emitted from the hide of ſeveral of the weazel tribe, beſide the civet cat. *Ambergris* is ſecreted by ſome ſpecies of whales. Birds, eſpecially water fowls, ſecrete a large quantity of oily matter, which they uſe in dreſſing their feathers. Some reptiles, eſpecially the toad, ſecrete an acrimonious fluid, which ſeems to ſerve them as a weapon of defence. Many ſerpents, as is well known, produce a moſt virulent poiſon, which they inſert into the wounds inflicted by their fangs. Some fiſhes ſecrete fluids of a ſimilar tendency. Few animals, however, form ſecretions ſo various and ſo uſeful, as the inſect tribes, from whom we procure *cochineal*, *kermes*, *lac*, *ſilk*, &c. Some of the molluſca, as the muſcle, and the ſpinning ſlug, alſo ſecrete a matter ſimilar to ſilk, by means of which they either ſecure themſelves firmly in their ſituations, or facilitate their progreſſive motion. The *ink* of the *cuttle fiſh*, ſuppoſed with no ſmall probability, to be the baſis of Indian or Chineſe ink, is alſo a remarkable animal ſecretion, which ſeems intended by nature to ſcreen the animal, and aſſiſt it in eluding the vigilance of its purſuers.

279
Vegetable ſecretions.

There are alſo many important vegetable ſecretions, conſtituting what are called *gums*, *reſins*, and *gum-reſins*; as *gum-arabic*, *gum-dragant*; *guaiac*, *dragon's blood*; *aſſafoetida*, *gamboge*, *myrrh*, *aloes*, and many others; for an account of which ſee CHEMISTRY and MATERIA MEDICA.

CHAP. XI. *Of Excretion.*

280
Excretion.

THE function of excretion differs but little in its nature from that of ſecretion already conſidered. As the organs of ſecretion ſeparate from the blood thoſe ſubſtances which are uſeful in the animal economy, ſo the excretory organs ſeparate from the blood, or from the food taken into the ſtomach, thoſe ſubſtances which are to be conveyed out of the body as excrementitious, viz. the ſolid excrement, the urine, and perſpiration.

281
Organs.

The organs of excretion, then, are chiefly the bowels, eſpecially the larger inteſtines, the kidneys, with their appendages,

* See *Saunders on the Liver*.

* *Principes de Phyſiol.* tom. iii. p. 592.

* *Phil. Tranſ.* for 1808, p. 2.

Of Excretion.

appendages, the ureters and urinary bladder, and the ſkin. For an account of theſe in the human body, ſee Anatomy, Part I.; and for the varieties of theſe organs in ſuch of the inferior animals as poſſeſs them, and for the means by which their abſence is ſupplied in others, ſee the works of Cuvier and Blumenbach already quoted.

282 Excretion by the inteſtines.

The phyſiology of inteſtinal excretion requires little explanation. The remains of the food, after the nutritious chyle has been extracted from it by the lacteals, are carried onward through the colon and rectum by the periſtaltic motion of the inteſtinal canal, excited to action by the ſtimulus of their contents, and of the bile, and aſſiſted by the preſſure of the abdominal muſcles, till they reach the extremity of the rectum, when becoming more ſtimulant, partly by their bulk, and partly by their increaſed acrimony, they rouſe the muſcular fibres of that inteſtine to greater action, ſo as, with the aſſiſtance of the abdominal muſcles, to overcome the reſiſtance of the *ſphincter*, and are thus expelled.

283 Relations.

Inteſtinal excretion is influenced by moſt of the preceding functions. 1. By the nervous power; as we find that in caſes of paralyſis, the excrements are not paſſed without artificial means, or they are voided involuntarily. 2. By motion. Thus we find that the action of the bowels is increaſed by exerciſe, and leſſened by indolence and a ſedentary life; though the quantity of excrement paſſed is greater in the latter caſe than in the former, ſhewing that the ſtimulus of the excrementitious matter is not ſufficient without muſcular action, to produce the regular performance of this function. 3. By digeſtion. It is well known that the ſtronger the digeſtive powers of the ſtomach, the more active are the bowels, and again, when theſe latter are overloaded with excrement, the functions of the ſtomach are diſordered. 4. By ſecretion. The action of the inteſtines is increaſed, when that of the ſecretory organs which pour their contents into the alimentary canal, becomes unuſually great, viz. in unuſual ſecretions of bile or mucus, as in *cholera* and *diarrhœa*; while, when thoſe ſecretions are defective, as in caſes of *jaundice*, the inteſtines become unuſually torpid.

284 Excretion by the kidneys.

The morbid affections of inteſtinal ſecretion have been conſidered under Medicine, N° 109—112, and 114, 115.

The organs deſtined for the excretion of urine afford the moſt complete apparatus for this function of any that we ſhall have occaſion to notice, conſiſting of an aſſemblage of glands, collected within one membrane; an excretory duct; a reſervoir for collecting the excreted fluid, and a canal for conveying it out of the body. Indeed we may conſider the kidneys rather as ſecreting than excreting organs, as the urine there formed differs ſo much in its nature and properties from the circulating fluids. We know, by a deciſive experiment, that the kidneys perform the whole of this office, and that the other organs are intended for the excretion of the urine; for when the ureters are tied or obſtructed next the bladder, we find that the ſecretion of urine ſtill goes on, and that the ureters above the obſtruction ſoon become filled and prodigiouſly diſtended.

The nature and properties of urine, in its natural ſtate, and as altered in certain diſeaſes, have been conſidered under Chemistry, N° 2670.

As the urine contains two ſubſtances that are not found in the blood, viz. *urea* and *uric acid*, Dr Thomſon concludes, on very probable grounds, that the office of the kidneys is not merely to ſeparate from the blood, a quantity of water and ſalts, but that they exert on this fluid ſome peculiar action, decompoſing ſome part of the blood, and forming ſome new ſubſtance or ſubſtances †.

† *Thomſon's Chemiſtry*, vol. v. 3d edit. p. 748.

285 Relations.

The mutual relations between this excretion and the preceding functions, are not many, or very important. During certain affections of the nervous ſyſtem there is a ſudden and copious excretion of limpid urine, and ſome mental emotions produce an involuntary flow of it ‡. And in caſes of palſy, an incontinence, or a total ſuppreſſion of urine, is very common. This excretion is conſiderably influenced by motion, being leſs copious in thoſe who uſe much exerciſe, or lead a laborious life.

‡ *Merchant of Venice*, act v. ſcene 1.

The morbid affections referable to this excretion, are noticed under Medicine, N° 118—122.

286 Excretion by the ſkin.

The excretion by the ſkin, or perſpiration, has exerciſed the ingenuity of many phyſicians and phyſiologiſts, ever ſince the time of Sanctorius; and though it is not now conſidered as ſo eſſential to life and health as it was in the beginning of the 18th century, is certainly of great importance. The quantity of watery fluid occaſionally thrown out by the ſkin in the form of ſweat, proves that, by means of this organ, the blood is freed from a great deal of uſeleſs or perhaps injurious matter, which could not ſo conveniently, or ſo perfectly, be expelled by other outlets. The nature of the matter perſpired, and the quantity of ordinary perſpiration, have been inveſtigated by many able experimentaliſts, the reſult of whoſe labours is given in the firſt volume of Johnſon's *Animal Chemiſtry*; the fifth volume (third edition) of Dr Thomſon's *Syſtem of Chemiſtry*; in a paper by Dr Kellie in the ſecond number of the *Edinburgh Medical and Surgical Journal*, and in our article Chemistry.

The principal facts that have been aſcertained with reſpect to the perſpirable matter thrown out by the ſkin, relate either to its quantity, or its chemical compoſition.

287 Quantity of the perſpiration.

I. The experiments on the quantity perſpired, on which we can the moſt rely, are thoſe of Lavoiſier, Seguin, and Mr Abernethy. From theſe experiments we may deduce the following concluſions: 1. The greateſt quantity of matter perſpired in a minute, amounts to about 26 grains troy, the leaſt to about 9 grains; giving an average of about 17 grains in the minute, or about 52 ounces in 24 hours. Dr Kellie eſtimates the quantity at about 30 ounces, which ſeems too ſmall. 2. The quantity of perſpiration is increaſed by drink, but not perceptibly by ſolid food. 3. Perſpiration is the leaſt in quantity immediately after a meal, and reaches its higheſt proportion during digeſtion.

288 Its compoſition.

II. The perſpirable matter is chiefly compoſed of a large quantity of water, ſome carbon or carbonic acid, a ſmall quantity of another acid, ſuppoſed to be the phoſphoric, and a peculiar oily matter of an odorous quality, differing in different animals, and, as it ſhould ſeem, in different individuals. The perſpiration of quadrupeds is frequently found to contain phoſphate of lime, and ſometimes urea. See Chemistry, N° 2552.

289 Relations.

As to the relations of perſpiration with the preceding functions, we may remark that this excretion is increaſed by various paſſions of the mind, by exerciſe, by healthy and rapid digeſtion; that it is generally in proportion to the vigour and quickneſs of the circulation and reſpiration, and that it is capable of ſupplying the defect of the two former excretions. On the contrary,

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Of Integumation.

it is leſſened by inactivity; by the impaired ſtate of the digeſtive organs; by languid circulation and reſpiration, and by violent purging, or evacuation of urine.

Chap. XII. *Of Integumation.*

290 Uſes of integuments as defence.

All living bodies are furniſhed with integuments, which are intended to afford them a defence againſt thoſe injuries to which their ſituation is commonly expoſed. Of the integuments ſome are uſeful in preventing the diſſipation of the fluids; ſome in reſiſting acrid and corroſive ſubſtances; ſome of them are indigeſtible in the ſtomach of animals, and ſome appear to be incorruptible in the earth. By theſe properties, ſeeds and the ova of inſects are preſerved for a conſiderable time, waiting the changes of ſoil or of ſeaſon that are favourable to their evolution. They are protected from the action of weak membranous ſtomachs, and thus the animals who may ſwallow them contribute to their propagation. It is thus the ſeeds of the miſſetoe are diſperſed, and depoſited on the bark of the oak or the aſh. There is a gelatinous ſubſtance frequently ejected by birds, and commonly called *tremella, noſtoc*, or ſtar-fall, which Dr Barclay has proved to be nothing elſe than the oviducts of frogs, which, as the embryo in form of an egg, moves along their winding canal, ſecrete that tranſparent and viſcid matter which conſtitutes the albuminous part of the ovum, and feeds and protects the embryo while in water.

The moſt important circumſtances with reſpect to integumation relate to the varieties of the integuments themſelves, and to the changes or renovation of theſe in different animals.

291 Integuments uſeful by their hardneſs;

I. Some integuments are uſeful, chiefly from their ſtrength and hardneſs. The *elytra* or ſhelly coverings of the beetle tribes afford an excellent defence for their membranous wings, when folded up; the ſhell of the ſnail lodges the inteſtines, when the animal comes forth to ſearch for food, and affords a ſafe retreat to the animal, when it is threatened with any danger from without. The ſhells of ſome animals can be opened and cloſed by a muſcular power; and ſome of them, as in the tail of the lobſter, are ſo diſpoſed in plates or ſcales, as to be no hindrance to the animal's motion. Several inſects which paſs a part of their time in the water, always compoſe for themſelves a ſhell, where it is needful.

292 by their external covering;

Some integuments are covered with feathers, ſome with hair or thick down. Beſides many other obvious uſes of theſe coverings, they generally ſerve to repel inſects; and being bad conductors of heat, tend to preſerve an equal and neceſſary temperature. Some integuments are covered with prickles, which oppoſe the attacks of an enemy by the ſtrength of their points, or by the venom which they infuſe, as in the ſtings of nettles, and the down of ſome other plants, and ſome inſects. Others again are moiſtened by a viſcid ſecretion, which preſerves the neceſſary ſoftneſs of the parts, prevents evaporation, reſiſts acrimony, enables ſome beings to deſtroy their enemies, and aſſiſts others in performing their progreſſive motions.

293 by their effluvia;

Both plants and animals, but particularly the former, are often protected by odorous effluvia from their integuments. Theſe effluvia are the finer parts of their volatile oil, always inflammable, and ſo ſubtile, that the continual emiſſion of it from wood or flowers does not ſenſibly diminiſh their weight. To this fragrance it is owing that the deadly nightſhade (*atropa belladonna*), the henbane, hounds-tongue, and many others, are ſeen on almoſt every high road untouched by animals. The manchinelle-tree of the Weſt Indies emits ſo very dangerous vapours, that the natives poiſon their arrows with its juices, and thoſe have died who have ventured to ſleep under its ſhade. The *lobelia longiflora* of America produces a ſuffocating oppreſſion in the breaſt of thoſe who reſpire in its vicinity. The return of a periodical diſorder has been attributed to the exhalation of the *rhus toxicodendron*. Of all the vegetable effluvia, however, that afford defence to the plant from which they proceed, or annoyance to the animals that approach it, none are equal to thoſe of the celebrated *bohun-upas*, or poiſon-tree of Java, whoſe exhalations have been ſaid to extend to the diſtance of ſeveral miles, preventing all acceſs of animals, or puniſhing the intruders with certain death. It is rather unfortunate for the botanical poets, that the effects of this poiſon have been greatly exaggerated, if indeed ſuch a marvellous tree really exiſts *.

* See *Pinkerton's Geography*, under *Java*.

294 by their colour.

Various colours of the integuments afford a ſpecies of defence. Caterpillars which feed on leaves are generally green; and earth worms the colour of the earth which they inhabit. Butterflies which frequent flowers are coloured like them. Small birds which frequent hedges have greeniſh backs like the leaves, and light-coloured bellies like the ſky, and are hence leſs viſible to the hawk who paſſes under them or over them. Thoſe birds which are much amongſt flowers, as the goldfinch, are furniſhed with vivid colours. The lark, partridge, and hare, are of the colour of dry vegetables or earth on which they reſt; and frogs vary their colour with the mud of the ſtreams which they frequent, and thoſe which live on trees are green. Fiſh which are generally ſuſpended in the water, and ſwallows which are generally ſuſpended in the air, have their backs the colour of the diſtant ground, and their bellies of the ſky. The *ſphinx convolvuli*, or unicorn moth, reſembles in colour the flower on which it reſts; and among plants, the nectary and petals of the *ophrys*, and of ſome kinds of the *delphinium*, reſemble both in form and colour the inſects which plunder them, and thus ſometimes eſcape from their enemies by having the appearance of being pre-occupied. From colour being thus employed as a defence, many animals vary their colours with the ſeaſons and circumſtances; and thoſe which are of different colours in ſummer according to the places which they inhabit, in winter aſſume in common the colour of the ſnow.

295 Change of integuments.

II. The changes that take place on the integuments conſiſt either of a partial, or complete, renewal of them. As the more ſuperficial integuments are commonly inſenſible to ſtimuli, and poſſeſs little or nothing of the vital principle; in all caſes where they cannot be enlarged to admit of an additional increaſe of growth, or, where they are not furniſhed with organs for repairing thoſe injuries which they may ſuffer from accident or diſeaſe, the body is endowed by nature with a power of throwing them off, and of producing others in their ſtead. Thus, ſerpents and toads ſlough their ſkins; the cruſtacea caſt their ſhells; the larvæ of inſects change their cuticle; and ſeveral trees, eſpecially the

Of Transformation. the cork tree, throw off their outer bark. Even man himſelf generally changes the cuticle, which peels off in the form of ſcales. Moſt animals once a year change their hair, wool, or feathers, and have theſe renewed by a freſh covering; a proceſs well known by the name of *moulting*. Some animals who do not uſually caſt their external covering, have the power of repairing this when injured. This is the caſe with moſt of the teſtacea, eſpecially ſnails.

Chap. XIII. *Of Transformation.*

296 Transformation. The alterations which organized beings undergo from *metamorphoſis* or transformation, are more ſtriking than thoſe which we have deſcribed in the preceding chapter. It has indeed been aſſerted, that theſe alterations conſiſt in throwing off certain temporary coverings; but this expreſſion is inaccurate, and ariſes from a want of preciſion of ideas. Transformation and change of integuments are really different; the truth is, transformation often takes place without any change of integuments, and there is often a change of integuments without any change of form. This new form is ſometimes occaſioned by a change of ſhape, conſiſtency, and colour, as when the lobes of a ſeed are converted into ſeminal leaves. It is at other times occaſioned by a change of proportion among the parts, and at others by the addition of new organs, as when the emmet receives wings, and the plume of the ſeed is fed by new roots ſtriking into the ground: or, laſtly, it is occaſioned by a change in the form and organs, and in their mode of operation, as happens in a remarkable degree to ſome inſects. Indeed, though all living bodies, both plants and animals, undergo ſome degree of transformation in the courſe of their exiſtence, theſe changes are moſt remarkable in inſects.

297 Transformation of reptiles; Many reptiles undergo very curious changes, but theſe are moſt remarkable in the frog tribe. The larva or tadpole, as it is called, of the frog, is an animal with a large head, a long tail, no limbs, and commonly poſſeſſed of gills, all obviouſly very different, both in form, proportion, and uſes, from the parts of the perfect animal. The curious appearance of what has been conſidered as the tadpole of the *rana paradoxa*, has led ſome naturaliſts to deſcribe it as an animal of a different genus, either a fiſh or a lizard; ſee Erpetology, p. 284.

298 of inſects. Many inſects appear to conſiſt of two diſtinct animal bodies, one within the other; the exterior, a creature of an ugly form, reſiding in the water, or under the earth, breathing by gills, or ſometimes by tracheæ projecting from the tail, poſſeſſing a voracious and grovelling appetite, and having a ſyſtem of ſanguiferous veſſels that circulates the blood towards the head. When all its parts decay and fall off, the creature incloſed ſucceeds in its ſtead: this often is an animal of a different form, generally lives in a different element, feeds on a different ſpecies of food, has different inſtruments of motion, different organs of ſenſe, different organs of reſpiration and differently ſituated; and being endowed with the parts of generation, inclines to gratify the ſenſual propenſity, and produces an embryo, which becomes like the firſt, and from which, in proceſs of time, a creature is evolved ſimilar to the former.

If the embryo or egg be depoſited on a leaf, the leaf is frequently obſerved to bend, to wrap it in folds, intended for the purpoſe of protecting it from injuries and danger. If depoſited in the body of an animal or plant, they accommodate themſelves to its wants and neceſſities, and furniſh a tumor which ſerves it for a nidus, and beſides, like an uterus, ſupplies it with nouriſhment; and if depoſited in the body of an inſect, the creature provides for the future deſtination of its young charge with all the tender care of a parent, and then dies. Of Transformation.

These circumſtances, added to the great variety of forms which inſects aſſume, render it ſometimes difficult to know who is the parent. We cannot, for inſtance, pronounce with certainty who is the true parent of the gordius, known by the name of the *ſeta equina*, or hair eel. A ſet of experiments which Dr Barclay once began with a view to throw ſome light on the ſubject, were unfortunately interrupted by an accident. He learned only, from a number of obſervations, that certain black beetles, at the end of ſummer, have the ſtrongeſt propenſity to run into the water, where they ſoon die; and that one or two, and ſometimes three or four of thoſe eels gradually drop from the beetle by the anus. Whether other inſects provide for the gordius in this manner, we have not yet been able to determine. 299 Parents of inſects often not eaſily diſtinguiſhed.

In all living bodies poſſeſſed of a *ſenſorium*, the changes of form, as well as the changes of habit and of age, are uſually accompanied with new propenſities, appetites, and paſſions. 300 Transformation accompanied by change of propenſities.

Microſcopic obſervations having demonſtrated, that all the forms of the plant and animal exiſted previouſly in the ſeed or embryo; transformation muſt be owing entirely to the evolution of the different parts by means of nutrition. 301 Conſiſts in the evolution of parts.

What nature intends by transformation, we cannot determine; but by means of it different elements are peopled, the different ſeaſons variouſly adorned, and animated nature wonderfully diverſified without a multiplication of beings. 302 Its uſes.

Chap. XIV. *Of Reproduction.*

In the preſent chapter we ſhall notice, firſt, the partial reproductions that take place in ſome claſſes of animals, and then take a general comparative view of the principal phenomena of generation, in the various claſſes of living beings. 303 Reproduction of parts.

Experiments have proved, that even in the ſuperior claſſes of animals, many parts of the body, when deſtroyed or removed, may be reproduced. A bone may be broken in ſuch a manner, that part of it muſt be taken away, but in a few weeks the ſeparated ends are brought together by the ſecretion of new bony matter, called *callus*. Little more than 24 hours have elapſed after a fracture, before nature begins her operations. The ſoft parts inflame; the perioſteum becomes ſwelled; the veſſels pour out coagulable lymph, and a pellucid, gelatinous ſubſtance appears about the broken extremities of the bone. Into this minute blood-veſſels are gradually ſent off from the arteries, and in no very long time phoſphate of lime begins to be ſecreted, for rendering the whole firm and compact. In caſes of *necroſis*, where the old bone entirely loſes its vitality, new bony matter is ſecreted into the ſurrounding perioſteum, which thickens and enlarges, and in time ſupplies the place of the old bone. When a muſcular part is cut away, as in removing fleſh that 304 In man and mammalia.

that has become gangrenous, if the healthy function of the ſurrounding parts can be reſtored, and the loſs of fleſh has not been too great, the wound gradually fills up, not indeed with fleſhy fibres, but with granulations very much reſembling the ordinary cellular ſubſtance. It is well known, that the hair, nails, and ſkin, are occaſionally renewed; but it will appear extraordinary that blood-veſſels, and even nerves, have been reproduced. In caſes of aneuriſm, where the trunk of the diſeaſed artery is divided, ſo as to cut off the uſual channel for the blood, the anaſtomoſing branches become gradually enlarged, and even new branches appear to be formed for carrying on the circulation. What has been ſaid above reſpecting the formation of *callus*, alſo proves the formation of new blood-veſſels; and the obſervations of Mr John Hunter put this beyond a doubt. Till within theſe few years, it was thought impoſſible that a divided nerve ſhould re-unite; but ſome late experiments of Mr Cruickſhank have proved that this re-union may take place*.

* *Phil. Tranſ.* 1795, p. 177.

Under this head we may mention ſome curious experiments that have been lately made by Dr Jones, on the means by which nature ſuppreſſes the hæmorrhage from divided arteries. Theſe experiments were made on dogs, and the reſults of them lead us to conclude, that the following is nearly the proceſs by which the hæmorrhage is ſuppreſſed. Firſt, the divided artery contracts, and is drawn within the neighbouring parts; blood is gradually effuſed into the ſheath of the artery and the adjoining cellular ſubſtance, where it is entangled, and affords a baſis for the formation of a coagulum or clot, which ſurrounds the extremity of the divided artery, and prevents the farther effuſion of blood, till another clot is formed within the mouth of the artery, plugging it completely up. Soon after there oozes out between the external and internal clot, a quantity of coagulable lymph, which cements all the parts together, and thus in time, if the artery divided be not very large, and the force of the circulation very great, the cavity of the veſſel and the divided extremity, is obliterated, and all further loſs of blood effectually prevented†.

† *Jones's Treatiſe on Hæmorrhages, &c.*

305 Reproduction of parts, in the inferior animals; It is, however, in the lower claſſes that we are to look for the moſt remarkable inſtances of this proviſion of nature, particularly among the reptiles, cruſtacea, molluſca, worms, and polypes.

306 in reptiles; In many reptiles, the legs and tail, when cut off, are ſoon renewed, and even the eyes have been re-produced. Some intereſting experiments on this ſubject by Spallanzani have been related under ERPETOLOGY, p. 316, to which we refer the reader.

307 in cruſtacea; In the cruſtacea, the legs and claws are very often torn away, either by accident, or by ſome voracious animal; but theſe never fail to be renewed in a ſhort time, provided the animal is in good health. This is moſt remarkable in the craw-fiſh (cancer aſtacus, Lin.). It has been obſerved that when the claw of this animal is broken, the moſt diſtant part is gradually caſt off, and about a day or two after, a red membrane, not unlike a bit of red cloth cloſes up the aperture. This is at firſt plain; but in the courſe of four or five days it aſſumes a convexity, which gradually augments till it takes the appearance of a ſmall cone, which exceeds not a line in height. It continues, however, to ſtretch out, and in ten days it is ſometimes more than three lines, or about one-fourth of an inch high. It is not hollow, but filled with fleſh, and this fleſh is the baſis or rudiment of a new claw. The membrane that covers the fleſh performs the ſame office to the young claw as the membranes do to the fœtus of the larger animals. It extends in proportion as the animal grows; and as it is pretty thick, we can perceive nothing but a lengthened cone. When 15 days are elapſed, this cone inclines towards the head of the animal. In a few days more its curvature increaſes, and it begins to aſſume the appearance of a dead claw. This claw, though at the end of a month or five weeks it has acquired the length of ſix or ſeven lines, which is more than half an inch, is ſtill incapable of action. The membrane in which it is encloſed becoming gradually thinner, in proportion as it extends, gives an opportunity of obſerving the parts of the claw, and we now perceive that this conical ſubſtance is not a ſimple congeries of fleſh. The moment is now arrived when the claw begins to be brought forth. The membrane at laſt burſts, and the new claw, though ſtill ſoft, appears without incumbrance or inveſtment. In a few days more it is covered with a ſhell; and though ſtill delicate, and not the half of its former length, it is able to perform all the natural functions. It has likewiſe been diſcovered, that, whether the claw has been lopped off at the fourth articulation, or anywhere elſe, the animal in a ſhort time recovers all that it had loſt. The ſame reproduction takes place alſo in the horns; but, if the tail is cut off, the animal ſurvives a few days only*.

* *Bingley's Animal Biog.* vol. iii.

308 in molluſca; Many of the molluſca exhibit curious inſtances of reproduction, eſpecially the actinia, the ſtar-fiſh, and ſnails. The abbé Dicquemaire made ſeveral experiments to aſcertain the reproductive power of the *actinia rufa* (purple ſea anemony). He firſt cut off all its tentacula, which grew again in leſs than a month; and on repeating this a ſecond and third time, he had equal ſucceſs. He cut off the upper part of one, and a few days after, the baſe of the animal was found to have fallen from its place; but it ſoon entirely recovered its limbs. But if the baſe of theſe animals is injured by the inciſion, the wound commonly proves mortal. The arms of the ſtar-fiſh are often torn off, but appear always to be reproduced. The power of ſnails in this reſpect is very great; for Spallanzani has aſcertained, that even if their heads are cut off, theſe are regenerated in no very long time. There can ſcarcely be a more ſurpriſing inſtance of animal reproduction than this, as we ſhall readily allow, if we conſider the complicated ſtructure of the head of a ſnail; that it contains a brain divided into two parts; that the horns attached to it are furniſhed with muſcles, and that on the tops of the larger horns there are eyes, compoſed of two coats and three humours; that the head contains a mouth, lips, teeth, and a palate; and yet all theſe parts, when cut away, have been reproduced in the courſe of a few weeks.

309 in polypes. On the reproductive power of polypes we have been ſufficiently minute under HELMINTHOLOGY, N° 84.

310 Writers on the reproduction of parts. As this ſubject of partial reproduction is extremely curious, and as we cannot here enter upon any particular detail on the experiments and obſervations that have been made on the ſubject, we ſhall conclude this part of the preſent chapter by enumerating the principal works to which the reader may refer for a more ſatiſfactory account of the ſubject. Theſe are chiefly Trembley,

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bley, *Memoires ſur les Polypes*; Bonnet, *Traité d'Inſectologie*, *Palingeneſie*, and *Conſiderations ſur les Corps Organiſés*, vol. ii.; Reaumur, *ſur les Inſects*; Spallanzani, *Tracts on Animals and Vegetables*, and *Eſſay on Reproduction*; Hunter's *Treatiſe on the Blood*, &c.; Ruſſel's *Practical Eſſay on Necroſis*. Moore *on the Healing Proceſs*; Murray, *de Redintegratione Partium*; and the publications of Dr Jones and Mr Cruickſhank already referred to. There is alſo a neat view of the principal facts relating to this ſubject in a theſis *De Vulnere Naturæ Sanando*, publiſhed at Edinburgh in 1805, by Dr John Gordon.

311 Reproduction of the ſpecies by generation. We have alredy ſtated it as our opinion, that plants, as well as animals, reproduce their like by generation. We ſhall not now enter on a diſcuſſion of the controverted point of the ſexual ſyſtem; and as the parts that appear ſubſervient to this function in plants, and their various modes of propagation, have been ſufficiently explained under the articles Botany and Plant, we ſhall in this chapter confine our attention to the generation of animals.

312 Organs. The human organs of generation are deſcribed in the article Anatomy, ſect. xv. thoſe of the cetacea under Cetology, N° 161.; thoſe of birds under *Comparative* Anatomy, 277: thoſe of fiſhes have been noticed under Ichthyology. For a more full comparative view of theſe organs, we refer to Cuvier and Blumenbach.

313 Nature of generation. The nature of generation which is the greateſt myſtery in the economy of living bodies, is ſtill involved in impenetrable obſcurity. The only circumſtance common to all generation, and conſequently the only eſſential part of the proceſs, is, that every living body is attached at firſt to a larger body of the ſame ſpecies with itſelf. It conſtitutes a part of this larger body, and derives nouriſhment, for a certain time, from its juices. The ſubſequent ſeparation conſtitutes *birth*, and may be the ſimple reſult of the life of the larger body, and of the conſequent developement of the ſmaller, without the addition of any occaſional action.

Thus the eſſence of generation conſiſts in the appearance of a ſmall organized body in or upon ſome part of a larger one; from which it is ſeparated at a certain period, in order to aſſume an independent exiſtence.

All the proceſſes and organs, which co-operate in the buſineſs of generation in certain claſſes, are only acceſſory to this primary function.

314 Gemmiparous generation. When the function is thus reduced to the moſt ſimple ſtate, it conſtitutes the gemmiparous, or generation by ſhoots. In this way the buds of trees are developed into branches, from which other trees may be formed. The polypes (hydra) ſee Helminthology, N° 84. and the ſea anemones (actiniæ), multiply in this manner; ſome worms are propagated by a diviſion of their body, and muſt, therefore, be arranged in the ſame diviſion. This mode of generation requires no diſtinction of ſex, no copulation, nor any particular organ.

315 Fecundation. Other modes of generation are accompliſhed in appropriate organs; the germs appear in a definite ſituation in the body, and the aſſiſtance of certain operations is required for their further developement. Theſe operations conſtitute *fecundation*, and ſuppoſe the exiſtence of *ſexual parts*; which may either be ſeparate, or united in the ſame individual.

In moſt animals the embryo of the future young is fecundated within the peculiar organs of one individual, while another of the ſame ſpecies is provided with the means of giving activity to the embryo by a fecundating fluid. In ſome animals, however, both theſe offices are performed by the ſame individual, which is then ſaid to be androgynous, or hermaphrodite.

316 Diſtinction of ſexes. The office of the male ſex is that of furniſhing the *fecundating* or *ſeminal fluid*; but the manner in which that contributes to the developement of the germ is not yet ſettled by phyſiologiſts. In ſeveral inſtances, particularly in the frog, the germ may be clearly recognized in the ovum before fecundation; its pre-exiſtence may be inferred in other caſes from the manner in which it is connected to the ovum when it firſt becomes viſible; for it is agreed on all hands, that the ovum exiſts in the female before fecundation, ſince virgin hens lay eggs, &c.

317 Hermaphrodites. The combination of the ſexes and the mode of fecundation are ſubject to great variety. In ſome inſtances they are united in the ſame individual, and the animal impregnates itſelf. The acephalous molluſca and the echini exemplify this ſtructure. In others, although the ſexes are united in each individual, an act of copulation is required, in which they both fecundate, and are fecundated; this is the caſe with the gaſteropodous molluſca and ſeveral worms. In the remainder of the animal kingdom the ſexes belong to different individuals.

318 Modes of impregnation. The fecundating liquor is always applied upon or about the germs. In many caſes the ova are extruded before they are touched by the ſemen, as in ſome bony fiſhes and the cephalopodous molluſca. Here, therefore, impregnation is effected out of the body, as it is alſo in the frog and toad. But in the latter inſtances the male embraces the female, and diſcharges his ſemen in proportion as ſhe voids the eggs. In moſt animals the ſeminal liquor is introduced into the body of the female, and the ova are fecundated before they are diſcharged. This is the caſe in the mammalia, birds, moſt reptiles, and ſome fiſhes; in the hermaphrodite gaſteropodous molluſca, in the cruſtacea, and inſects. In all the laſt-mentioned orders ova may be diſcharged without previous copulation, as in the preceding. But they receive no further developement; nor can they be fecundated when voided *. We ſhall not gratify the prurient imagination of the philoſophic ſenſualiſt, by any details of the mode in which theſe operations are carried on in the various claſſes of animals, except in one inſtance, which is ſo curious that we ſhall be excuſed for deſcribing it. We allude to the copulation of the ſnail.

* *Cuvier Leçons d'Anat. Comp.* tom. v. p. 12.

319 Copulation of ſnails. Theſe animals meet in pairs, and ſtationing themſelves an inch or two apart, launch ſeveral little darts, not quite half an inch long, at each other. Theſe are of a horny ſubſtance, and ſharply pointed at one end. The animals, during the breeding ſeaſon, are provided with a little reſervoir for them, ſituated within the neck, and opening on the right ſide. On the diſcharge of the firſt dart, the wounded ſnail immediately retaliates on its aggreſſor by ejecting at it a ſimilar dart; the other again renews the battle, and in turn is again wounded. Thus are the darts of Cupid, metaphorical with all the reſt of the creation, completely realiſed in ſnails. After the combat they come together. Each of them lays its eggs in ſome ſheltered and moiſt ſitua-

tion,

Of Reproduction.

tion, generally under a little clod of earth, or in some cool cavity †.

The effect of a single copulation varies in its degree: it usually fecundates one generation only; but sometimes, as in poultry, several eggs are fecundated; still, however, they only form one generation. In a very few instances one act of copulation fecundates several

320 generations, which can propagate their species without the aid of the male. In the plant-louse (*aphis*) this has been repeated eight times; and in some *monoculi* 12 or 15 times.

321 Oviparous generation.

When the germ is detached from the ovary, its mode of existence may be more or less complete. In most animals it is connected, by means of vessels, to an organized mass, and the absorption of which nourishes and developes it until the period of its birth. It derives nothing, therefore, from the body of the mother, from which it is separated by coverings varying in number and solidity. The germ, together with its mass of nourishment, and the surrounding membranes, constitutes an egg, or *ovum;* and the animals which produce their young in this state, are denominated *oviparous*.

In most of these the germ contained in the egg is not developed until that part has quitted the body of the mother, or has been *laid;* whether it be necessary that it should be afterwards fecundated, as in many fishes; or require only the application of artificial heat for its incubation, as in birds; or that the natural heat of the climate is sufficient, as in reptiles, insects, &c. These are strictly oviparous animals.

322 Ovo-viviparous animals.

The ovum, after being fecundated and detached from the ovarium, remains in some animals within the body of the mother, until the contained germ be developed and hatched. These are *false viviparous* animals, or *ovo-viviparous*. The viper, and some fishes, afford in-

323 Viviparous generation.

stances of this process. Mammalia alone are truly viviparous animals. Their germ possesses no provision of nourishment, but grows by what it derives from the juices of the mother. For this purpose it is attached to the internal surface of the uterus, and sometimes, by accident, to other parts, by a kind of root, or infinite ramification of vessels, called *placenta*. It is not, therefore, completely separated from the mother by its coverings. It does not come into the world until it can enjoy an independent organic existence. The mammalia cannot, therefore, be said to possess an *ovum* in the sense which we have assigned to that term.

From this view of the subject, generation may be said to consist of four functions, differing in their importance, and in the number of animals to which they belong.

1. The *production of the germ*, which is a constant circumstance; 2. *Fecundation*, which belongs only to the sexual generation; 3. *Copulation*, which is confined to those sexual generations, in which fecundation is accomplished within the body; 4. *Uterogestation*, which belongs exclusively to viviparous generation *.

There is a general rule observable among all quadrupeds, that those which are large and formidable produce but few at a time; while such as are mean and contemptible are extremely prolific. The lion, or tiger, have seldom above two cubs at a litter; while the cat,

324 Comparative fecundity of animals.

that is of a similar nature, is usually seen to have five or six. In this manner, the low tribes become extremely numerous; and, but for this surprising fecundity, from their natural weakness, they would quickly be extirpated. The breed of mice, for instance, would have long since been blotted from the earth, were the mouse as slow in production as the elephant. But it has been wisely provided, that such animals as can make but little resistance, should have at least a means of repairing the destruction which they must often suffer, by their quick reproduction; that they should increase even among enemies, and multiply under the hand of the destroyer. On the other hand, it has as wisely been ordered by Providence, that the larger kinds should produce but slowly; otherwise, as they require proportional supplies from nature, they would quickly consume their own store; and, of consequence, many of them would soon perish through want; so that life would thus be given without the necessary means of subsistence. In a word, Providence has most wisely balanced the strength of the great against the weakness of the little. Since it was necessary that some should be great and others mean, since it was expedient that some should live upon others, it has assisted the weakness of one by granting it fruitfulness, and diminished the number of the other by infecundity.

In consequence of this provision, the larger creatures, which bring forth few at a time, seldom begin to generate till they have nearly acquired their full growth. On the contrary, those which bring many reproduce before they have arrived at half their natural size. Thus the horse and the bull are at their best before they begin to breed: the hog and the rabbit scarce leave the teat before they become parents in turn. Almost all animals likewise continue the time of their pregnancy in proportion to their size (L).

For an account of the principal phenomena attending 325 the reproduction of the human species, viz. the requisites for conception and its signs; the effects of impregnation; the gradual evolution of the fœtus, and the successive changes that take place in the uterine system during uterogestation, see the article MIDWIFERY, chap. i. and ii. The phenomena of reproduction in other viviparous animals are so analogous to those in the human species, that we need not enter on an examination of them. We shall here only give a view of the successive changes that take place in the egg of birds during incubation, taken from the observations of the celebrated Blumenbach.

326 Progressive changes of the chick during incubation.

The following observations refer to the egg of the common hen, as affording the most familiar example of incubation.

A small shining spot, of an elongated form, with rounded extremities, but narrowest in the middle, is perceived at the end of the first day, not in nor upon the

† Shaw's Naturalist's Miscellany, vol. i.

* Cuvier, lec. xxix.

(L) In the following table are noted the time of gestation, incubation, and the number of young produced in several species of quadrupeds and birds, as far as these have been ascertained; and the second column shews the period to which the life of each is usually extended.

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the cicatricula (M), but very near that part on the yolk-bag. This may be ſaid to appear before-hand, as the abode of the chick which is to follow.

Second day.

317 No trace of the latter can be diſcovered before the beginning of the ſecond day; and then it has an incurvated form, reſembling a gelatinous filament with large extremities, very cloſely ſurrounded by the amnion, which at firſt can ſcarcely be diſtinguiſhed from it.

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3 T 2 About

	Species.	Period of Life.	Time of Geſtation.	Number of Young.
Quadrupeds.	Apes.	- - -	- - -	About 2.
	Bats.	- - -	- - -	From 2 to 5.
	Sloth.	- - -	- - -	One.
	Rhinoceros.	70 or 80 years.	- - -	One.
	Elephant.	Above 100 years.	21 months.	One.
	Arctic walrus.	- - -	9 months.	One.
	Seal.	- - -	- - -	About 2.
	Bitch.	12 or 16 years.	9 weeks.	From 4 to 10.
	Wolf.	- - -	$3\frac{1}{2}$ months.	5 or 6.
	Fox.	About 14 years.	6 weeks.	From 3 to 6.
	Jackall.	- - -	- - -	From 6 to 8.
	Lioneſs.	Above 70 years.	- - -	4 or 5.
	Tigreſs.	- - -	- - -	Ditto.
	Cat.	From 10 to 18 years.	8 weeks.	From 4 to 6.
	Ferret.	- - -	6 weeks.	6 or 7.
	Otter.	- - -	9 weeks.	4 or 5.
	Virginian opoſſum.	- - -	- - -	Ditto.
	Kanguroo.	- - -	- - -	One.
	Mole.	- - -	- - -	4 or 5.
	Porcupine.	- - -	- - -	Two.
	Guinea pig.	6 or 7 years.	3 weeks.	From 5 to 12.
	Common rat.	- - -	5 or 6 weeks.	From 12 to 18.
	Mouſe.	From 2 to 3 years.	- - -	From 6 to 10.
	Common ſquirrel.	- - -	6 weeks.	From 4 to 5.
	Hare.	- - -	A month.	3 or 4.
	Rabbit.	- - -	Ditto.	About 8.
	Camel.	40 or 50 years.	12 months.	One.
	Rein deer.	15 or 16 years.	8 months.	Two.
	Stag.	Near 50 years.	5 months.	One.
	Goat.	- - -	5 months.	About 2 or 3.
	Ewe.	15 years.	Ditto.	From 1 to 3.
	Cow.	- - -	9 months.	1 to 3.
	Mare.	30 or 40 years.	11 months.	1 or 2.
	Sow.	Nearly 20 years.	4 ditto.	From 10 to 20.
			Time of Incubation.	
Birds.	Eagle.	Above 100 years.	30 days.	2 or 3.
	Raven.	Near 100 ditto.	20 ditto.	5 or 6.
	Cuckoo.	- - -	- - -	1 or 2.
	Humming bird.	- - -	12 days.	Two.
	Blackbird.	- - -	14 ditto.	4 or 5.
	Canary bird.	10 or 20 years.	Ditto.	Ditto.
	Wren.	- - -	Ditto.	From 10 to 18.
	Pigeon.	- - -	Ditto.	Two.
	Turkey.	- - -	A month.	18 or 20.
	Hen.	About 13 years.	3 weeks.	About 20.
	Oſtrich.	- - -	6 weeks.	One or two each.
	Swan.	Above 100 years.	Ditto.	6 or 8.
	Gooſe.	Near 100 years.	A month.	9 to 12.
	Duck.	- - -	Ditto.	12 to 14.

(M) The ſtructure of an egg has already been deſcribed under the article EGG; but for the better underſtanding of Blumenbach's obſervations, it may be neceſſary to enumerate the ſeveral parts, with the names given to them by that author. The membrane lining the ſhell is called *membrana albuminis*, and includes the two whites of the egg, the inner of which ſurrounds the yolk, which is contained within a peculiar, very delicate membrane, called the *yolk-bag*. From two oppoſite ſides of this bag proceeds a white knotty body, terminating in the white of the egg, by a flocculent extremity. Theſe bodies are called the *chalazæ* or *grandines*; the *cicatricula*, tread, or traddle, is ſurrounded by one or more whitiſh concentric circles called *halones*, or *circuli*, the uſe of which is not known.

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About this time the halones enlarge their circles; but they soon after disappear entirely, as well as the cicatricula.

The first appearance of red blood is discerned on the surface of the yolk-bag, towards the end of the second day. A series of points is observed, which form grooves; and these closing, constitute vessels, the trunks of which become connected to the chick. The vascular surface itself is called *figura venosa*, or *area vasculosa*; and the vessel by which its margin is defined, *vena terminalis*. The trunk of all the veins joins the *vena portæ*; while the arteries, which ramify on the yolk-bag, arise from the mesenteric artery of the chick.

328 Third day. On the commencement of the third day, the newly formed heart is discerned by means of its triple pulsation, and constitutes a threefold *punctum saliens*. Some parts of the incubated chicken are destined to undergo successive alterations in their form; and this holds good of the heart in particular. In its first formation it resembles a tortuous canal, and consists of three dilations lying close together, and arranged in a triangle. One of these, which is properly the right, is then the common auricle; the other is the only ventricle, but afterwards the left; and the third is the dilated part of the aorta.

About the same time, the spine, which was originally extended in a straight line, becomes incurvated; and the distinction of the vertebræ is very plain. The eyes may be distinguished by their black pigment, and comparatively immense size; and they are afterwards remarkable in consequence of a peculiar slit in the lower part of the iris.

329 Fourth day. From the fourth day, when the chicken has attained the length of four lines, and its most important abdominal viscera, as the stomach, intestines, and liver, are visible, (the gall-bladder, however, does not appear till the sixth day), a vascular membrane begins to form about the navel; and increases in the following days with such rapidity, that it covers nearly the whole inner surface of the shell, within the *membrana albuminis*, during the latter half of incubation. This seems to supply the place of the lungs, and to carry on the respiratory process instead of those organs. The lungs themselves begin indeed to be formed on the fifth day; but, as in the fœtus of the mammalia, they must be quite incapable of performing their functions while the chick is contained in the amnion.

330 Sixth day. Voluntary motion is first observed on the sixth day, when the chick is about seven lines in length.

331 Ninth day. Ossification commences on the ninth day, when the ossific juice is first secreted, and hardened into bony points. These form the rudiments of the bony ring of the sclerotica, which resembles at that time a circular row of the most delicate pearls.

At the same period, the marks of the elegant yellow vessels on the yolk-bag, begin to be visible.

332 Fourteenth day. On the fourteenth day the feathers appear; and the animal is able to open its mouth for air, if taken out of the egg.

333 Nineteenth day. On the nineteenth day it is able to utter sounds; and on the twenty-first to break through its prison, and commence a new life.

Blumenbach concludes his observations with a few remarks on those very singular membranes, the yolk-bag

and the chorion, which are so essential to the life and Of Reproduction.
preservation of the animal.

The chorion, that most simple yet most perfect temporary substitute for the lungs, if examined in the lat- 334 Remarks on the chorion.
ter half of incubation in an egg very cautiously opened, presents, without any artificial injection, one of the most splendid spectacles that occurs in the whole organic creation. It exhibits a surface covered with numberless ramifications of arterial and venous vessels. The latter are of a bright scarlet colour, as they are carrying oxygenated blood to the chick; the arteries, on the contrary, are of a deep or livid red, and bring the carbonated blood from the body of the animal. Their trunks are connected with the iliac vessels; and, on account of the thinness of their coats, they afford the best microscopical object for demonstrating the circulation in a warm-blooded animal.

The other membrane is also connected to the body 335 On the yolk-bag.
of the chick; but by a two-fold union, and in a very different manner from the former. It is joined to the small intestine, by means of the *ductus vitello-intestinalis*, and also by the blood-vessels, with the mesenteric artery and vena portæ.

In the course of the incubation the yolk becomes constantly thinner and paler, by the admixture of the inner white. At the same time innumerable fringe-like vessels with flocculent extremities, of a most singular structure, form on the inner surface of the yolk-bag, opposite to the yellow ramified marks, and hang into the yolk. There can be no doubt that they have the office of absorbing the yolk, and conveying it into the veins of the yolk-bag, where it is assimilated to the blood, and applied to the nutrition of the chick. Thus in the chick which has just quitted the egg, there is only a remainder of the yolk and its bag to be discovered in the abdomen. These are completely removed in the following weeks, so that the only remaining trace is a kind of cicatrix on the surface of the intestine *.

* Blumenbach's Comp. Anat. chap. xxvii.

Many of the causes which contribute to the formation of a living body have hitherto eluded human research; may in all probability never be discovered; and perhaps are beyond human comprehension.

Some philosophers, discovering the extreme divisibili- 336 Theories of generation.
ty of matter, and learning from the microscope that transformation is but the developement of certain parts that previously existed, have thence imagined that ge- 337 Hypothesis of successive evolution.
neration is somewhat analogous; that all organised bodies received their form at the beginning; that the first of every genus and species contained by involution the numberless millions of succeeding generations; and that the union of the two sexes gives only a stimulus, and brings into view forms that had existed since the world began.

By this hypothesis they have attempted to explain a 338 Objections.
thing that is unknown by what must remain for ever incomprehensible to the human mind in its present state. They absurdly appeal from observation to conjecture; and suppose that bodies which are originally brought into view, which are daily augmented, frequently repaired, and sometimes renewed by organic action, do nevertheless in their first formation require an effort superior to what omnipotence is able to perform by secondary agents. Had the supporters of this hypothesis considered that many herbaceous plants produce new flowers

when

Of Reproduction. when the first set are untimely cut off; that lobsters and many other animals renew their limbs, and that certain polypes can raise a structure so perfectly resembling a vegetable form as to puzzle the naturalist whether or not he should class them under plants, they would surely not have prescribed such bounds to omniscient wisdom and almighty power, or declared with such confidence what the Author of nature, to speak with the vulgar, must necessarily perform by his own hands, or what he may intrust to secondary causes regulated by his laws.

These philosophers will find it difficult to account in a very satisfactory manner for monstrous productions, and for those changes of structure and of form which for a while continue hereditary from the influence of habit. They object to others, that all the parts of a living body are mutually dependent on one another, and that they must necessarily have been coeval, or have existed at once. But though every attempt that has yet been made to ascertain which of the vital organs are prior and which posterior in a living body has proved unsuccessful, it has not been demonstrated that either themselves or their functions are coeval. It may, on the contrary, be plainly demonstrated from observation, that the lungs and the stomach do not begin to perform their functions so early as the heart and the vascular system; that even the heart and its system perform their functions with some considerable changes, immediately after birth; that the vegetable tribes are without nerves; and that the brain and nerves in the animal kingdom perform more and more of their functions, according as the system approaches towards maturity. It has even been shewn, that bones will unite; that the limbs of an animal continue to be nourished without the nerves; that there is a principle of life in the blood; that the heart will act under other stimuli beside that of nervous influence; and sound logic does by no means require us to suppose, that the first action of the foetal heart, or the *punctum saliens*, is owing to the influence of stimuli from the brain, or that the brain must have existed when the heart first moved. Although the minuteness and transparency of the parts may prevent us from seeing the first gradual formation of the embryo, yet every observation corroborates the opinion, that it is formed by secondary causes, and through the medium of organic powers.

339 Hypothesis of Epigenesis. Most physiologists have believed, the certain inorganic particles are contained in the system of one sex or of the other, and that by the union of the sexes these particles have become organised. It has, however, been asked whether or not is the embryo formed by the joint operation of the two sexes? or is it formed entirely by one, and brought into action by a stimulus from the other? The former of these questions supposes that each of the sexes has a seminal fluid; that some mixture takes place in the uterus, and produces an embryo, in the same manner that a neutral salt assumes a certain and determinate form. The notion implies some general and confused ideas of chemical combination; but does not bespeak a very clear understanding, profound reflection, or much acquaintance with the nature and properties of living bodies.

For a long time past the most rational physiologists have generally thought that the embryo is formed gradually and slowly in one or other of the two sexes, not by chemical combination, but a system of organs, directed by laws and prompted by stimuli, with many of which we are yet unacquainted. From the great Hippocrates to Fabricius and Harvey, the credit of furnishing the foetal embryo was almost universally given to the females of oviparous animals. Among the viviparous, the appearances were such, that the female was left to contest it with the male. At last the eclat of Leeuwenhoek's discoveries seemed to put an end to all doubts entertained upon the subject. He very plainly saw through his microscope that very great profusion of particles that move to and fro with amazing rapidity in the male semen. Upon this he embraced the doctrine of Hamme, who had seen them before, and supposed from their motions that these particles were not only animalcules, but the principles or rudiments of that animal in whom they were formed, and that they were deposited in the uterus of the female only to be nourished and augmented in size. 340 Embryo supposed to be derived from the male.

341 Objections. What raised objections against this theory was, that numerous animalcules were discoverable by the microscope in other fluids, and that a vast profusion of young embryos appeared in cases where never more than one or two arrive at maturity. It was an objection to it, that some females had been impregnated, where the hymen remained unbroken, so that the impregnating fluid could have reached only the mouth of the uterus. Again, in frogs, fishes, and many other animals, the ova are not impregnated till after extrusion; and lastly, Haller had observed the chick completely formed in eggs that had not been fecundated.

It is now, we believe, pretty generally known, that the embryo does not commence its existence in the cavity of the uterus. De Graaf observed it on its passage down the fallopian tube; he saw the place where it first began in the ovarium of the female, and cases have occurred where it has missed the fallopian tube, where it has fallen into the abdomen, in which the placenta has been formed, and the foetus has grown among the bowels.

342 More probable that the embryo exists in the female. From these facts it has been concluded, notwithstanding some feeble objections, that the female ovaria contain the embryos in the form of eggs; that these eggs are brought into action by the stimulating power of the male semen, which is sometimes thrown into the cavity of the uterus, sometimes applied only to its mouth, and sometimes sprinkled on the eggs after they are extruded. For more on this subject see the article MIDWIFERY.

343 Relations. A view of the relations between the present function and those which we have before examined, is a subject of so delicate a nature, that we must not enlarge on it. The sympathy between the reproductive and the nervous systems is well known. The effect which desire has occasionally produced on the brain is very great, madness being not unfrequently the consequence, either of too much indulgence, or of total continence. We are of opinion that the influence of the fancy or imagination on the uterine system has been overrated, though the accounts given of monsters or deformed births, in consequence of terror experienced by the mother, appear to be too well authenticated to warrant our total disbelief in this influence. Too much indulgence in this appetite produces a debilitated state, both of the

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the mental and bodily functions, and deprives the ſyſtem of that natural ſtimulus which ſeems eſſential to the activity and vigour of the body in the male.

Chap. XV. *Of Sleep and Torpor.*

344 Neceſſity of ſleep.

We have already conſidered the active means by which the waſte of the body is repaired; but all theſe would have little effect, and could not indeed be carried on for any conſiderable time, without ſome general relaxation of the ſyſtem. This relaxation is brought about by ſleep, in which the active functions find a repoſe from the labours which they have undergone during the day; and in this way the ſyſtem is recruited more completely than by any other means.

345 Sleep, an affection of mind.

Sleep may be conſidered as an affection of mind, and therefore more properly a ſubject of metaphyſical, than of phyſiological ſpeculation. It is, however, generally treated of in ſyſtems of phyſiology; and it will be neceſſary to take notice of ſome circumſtances reſpecting it. We ſhall chiefly conſider the ſtate of the body and mind during ſleep, and ſome of the principal theories that have been contrived to account for it.

346 Phenomena of ſleep.

Natural ſleep returns at certain intervals, which are, however, different in different animals. Moſt animals, and eſpecially man, ſleep only during the night, but moſt of the predacious ſpecies, as beaſts and birds of prey, chooſe this time for their predatory excurſions, and repoſe during the day. Sleep comes on with an unuſual languor and laſſitude; an averſion to motion; the mind becomes unfit for its uſual exertions; and the deſire of reſt pervades the whole ſyſtem. In particular, the extenſor muſcles loſe their power of preſerving the body in an erect poſture; the eyelids involuntarily fall; the head bows forward; the joints bend, and the body ſinks. During ſleep, all the voluntary motions are in general ſuſpended; but the involuntary actions of the heart and lungs proceed, though not ſo vigorouſly as in the waking ſtate; the circulation and reſpiration being ſlower than uſual. Moſt of the ſenſes are alſo in a ſtate of repoſe, eſpecially thoſe of feeling, ſmell, and probably of taſte. Hearing is, in ſome animals, very acute during ſleep, and they are thus enabled to eſcape any danger that threatens them. Some animals, as the hare, alſo ſleep with their eyes open; and in moſt the impreſſion of light, when the eyelids are raiſed, is very evident. The functions of digeſtion, abſorption, and ſecretion, ſeem to proceed with greater eaſe and activity during ſleep; and aſſimilation and nutrition are much promoted by this ſtate of repoſe. Some of the faculties of the mind, eſpecially the imagination, are, however, in full vigour, as appears from the dreams that take place during ſleep. The duration of ſleep is exceedingly various. Among the human ſpecies, young children, and very old perſons, paſs the greateſt half of their time in ſleep, while middle-aged and active people ſeldom ſleep ſo much as one third of the 24 hours.

Though the returns of ſleeping and waking depend much on cuſtom, they may, however, be changed by various circumſtances; and though the commencement of one of theſe periods happen to be altered, that of the other may remain as before. If a perſon is accuſtomed to go to ſleep exactly at nine in the evening, and to riſe again at ſix in the morning, though the time of ſleep may be occaſionally protracted till twelve, he will yet awaken at his uſual hour of ſix: or if his ſleep be continued by darkneſs, quietneſs, or ſimilar cauſes, till the day be farther advanced, the deſire of ſleep will return in the evening at nine.

347 Theory of ſleep.

Moſt of the cauſes that produce or prevent ſleep, have been mentioned in the article Medicine, N° 94. As to the immediate cauſe, the opinions of phyſiologiſts are much at variance, and the theory of ſleep is as little underſtood as that of any function of the animal economy.

348 Hypotheſis of Haller.

According to Haller, ſleep ariſes, either from a ſimple abſence, deficiency and immobility of the ſpirits, or from compreſſion of the nerves, and always from the motion of the ſpirits through the brain being impeded *. That ſleep is, ſome how or other, connected with a compreſſion of the brain, appears very probable, from the heavineſs and coma that take place in caſes where ſuch a compreſſion has evidently been produced; but how this compreſſion acts has never yet been ſatisfactorily explained; and the obſtruction that Haller ſuppoſes in the motion of the animal ſpirits, or nervous fluid, is gratuitous.

* *Firſt Lines of Phyſiology,* § 585.

349 Of Brown.

One of the faſhionable doctrines of the preſent day reſpecting the immediate cauſe of ſleep is, that this ſtate is produced by an exhauſtion of irritability or excitability. According to Brown, ſleep ſucceeds a diminution of excitement, during which the excitability is either only ſo far diminiſhed that it can be accumulated again, or ſo abundant, that the exceſs can be waſted, and in each caſe the excitement reſtored †.

† *Elem. Med.* § 337.

350 Of Darwin.

Similar to this is the doctrine of Zoonomia, that ſleep depends on an exhauſtion of ſenſorial power. Dr Darwin thus characterizes perfect ſleep: 1. The power of volition is totally ſuſpended. 2. The trains of ideas cauſed by ſenſation proceed with greater facility and vivacity; but become inconſiſtent with the uſual order of nature. The muſcular motions cauſed by ſenſation continue; as thoſe concerned in our evacuations during infancy, and afterwards in digeſtion, and in priapiſmus. 3. The irritative muſcular motions continue, as thoſe concerned in the circulation, in ſecretion, and reſpiration. But the irritative ſenſual motions, or ideas, are not excited; as the immediate organs of ſenſe are not ſtimulated into action by external objects, which are excluded by the external organs of ſenſe; which are not in ſleep adapted to their reception by the power of volition, as in our waking hours. 4. The aſſociate motions continue, but their firſt link is not excited into action by volition, or by external ſtimuli. In all reſpects, except thoſe above mentioned, the three laſt ſenſorial powers are ſomewhat increaſed in energy during the ſuſpenſion of volition, owing to the conſequent accumulation of the ſpirit of animation ‡.

‡ *Darwin's Zoonomia,* vol. i. § 18.

Thus, the immediate cauſe of ſleep conſiſts in the ſuſpenſion of volition produced by the exhauſtion of ſenſorial power; and hence, whatever diminiſhes the general quantity of ſenſorial power, acts as a remote cauſe of ſleep.

Beſide the inſufficiency of theſe hypotheſes to account for many circumſtances that take place during ſleep, we may remark, that this ſtate is often produced when no exhauſtion of irritability, excitability, or ſenſorial power, can be ſuppoſed to have taken place. Thus, the propenſity to ſleep often becomes irreſiſtible from the effects of monotonous ſpeaking, from ſtillneſs, darkneſs, or from

from the sameness of the scenery around us; and when one stimulus, after long application, can arouse no more, another stimulus that in ordinary cases is less powerful, produces excitement, and keeps off sleep; an evident proof that excitability or sensorial power have not been very far exhausted.

351 Supposed sleep of plants.

Plants have been said to sleep. At the approach of night, many of them are observed to change their appearances very considerably, and sometimes even to such a degree as scarcely to be known for what they are. These changes happen principally to the leaves and the flowers. During the night, many leaves, according to the nature and genus of the plant, are seen to rise up, to hang down, or to fold themselves in various ways, for the protection of the flowers, the buds, the fruits, the young stems; and many flowers, to escape a superabundance of moisture, to hang down their mouths towards the earth, or to wrap themselves up in their calices. These phenomena are owing to stimuli acting from without; we may add, that most of the motions are performed at the joints where the leaves and petals articulate with the stem. A period of rest is as necessary to plants as sleep is to animals. The irritable principle cannot act long under the influence of the same stimulus, except at intervals, and the rapid growth observable in plants during the night, is a strong proof that the organs employed in assimilation had been disturbed in discharging their functions during the day, when exposed to the action of heat and light and of other stimuli.

352 Dreaming.

In our general outline, we had proposed introducing here an account of the phenomena of dreams, but we find that this subject has been so fully discussed under the article DREAM, that any additional remarks would be unnecessary. To this article therefore we refer the reader.

Rules for the management of the body with respect to sleep, scarcely come within our present province; but as we pass so much of our time in this state, during which we are sometimes occupied in a very agreeable manner, while at others we are subject to most uneasy sensations, it is a matter of considerable consequence to take those measures which may secure to us the former, and enable us to avoid the latter. We have seen few rules better adapted to those purposes than those of Dr Franklin; but as more important matter presses for insertion within the circumscribed limits to which we are restricted, we must refer our readers to the original paper, which is published in the late 8vo edition of *Franklin's Works*, vol. iii. p. 437.

353 Somnambulism.

In a few cases, not only the imagination has a full range during sleep, but the voluntary motions of the body, and even the exercise of some of the external senses, are carried on with apparently as much perfection as when the person is awake. This state is called *somnambulism*, or sleep-walking, and is commonly considered as a variety of dreaming. Many surprising accounts have been given of sleep-walkers. They have been known to rise, dress themselves, go out of doors, and sometimes out of a window, from which they have climbed upon the roof of a house, dig in a garden, draw water from a well, saddle a horse and ride several miles; maintain a rational and interesting conversation, and even go through a laborious and difficult literary task; and after having performed these exploits, they have returned to their bed without being conscious of what they had been doing. This want of consciousness appears from their remembering nothing when they awake, of what passed during their sleep. It is disputed whether somnambulists incur as much danger in the actions which they perform, as those who are awake, in similar circumstances. We are inclined to think that the danger is much less in the former case, as sleep-walkers seem entirely free from the terror which commonly attends the attempting of any hazardous enterprise when awake; such as mounting to the roof of a house, climbing a steeple, &c. If suddenly awaked, however, while engaged in any of their hazardous actions, the danger is very great.

354 Reverie.

Dr Darwin considers somnambulism, not as a state of sleep or dreaming, but as a variety of reverie, carried to a morbid extent, so as to become a sort of epileptic or cataleptic paroxysm. In the state of reverie, according to Dr Darwin, the irritative motions occasioned by internal stimuli continue, those from the stimuli of external objects are either not produced at all, or are never succeeded by sensation or attention, unless they are at the same time excited by volition; the sensitive motions continue, and are kept consistent by the power of volition; the voluntary and associate motions continue undisturbed. He considers reverie as an effort of the mind to relieve some painful sensation, whence it is allied to convulsion and insanity *.

355 Torpor of animals.

The torpor that takes place in many animals during winter, appears to be so nearly allied to sleep, that we shall consider it in this chapter.

A great variety of animals of almost every class, retire during the cold of winter, to the recesses of caverns, holes in old walls, hollow trees, or below the earth, where they remain in apparently a lifeless state till the return of spring rouses them from their trance. We shall here enumerate the different animals that have been known to undergo this state of hibernation.

356 Hibernating mammalia.

Bats, especially the *vespertilio murinus*, *auritus*, and *v. noctula* (see MAMMALIA, N° 39.); *bears*, especially the brown and the polar bear, and the badger; the *hedgehog*, (*erinaceus Europeus*); several species of the mouse and rat tribe, but more especially the *hamster* (*mus cricetus*), the *marmots*, especially the *arctomys marmota*, (see MAMMALIA, N° 124.); the *dormouse* (*myoxus muscardinus*). Sheep appear capable of living for a considerable time in a torpid state, as they have been known to remain alive for several weeks, buried under the snow.

357 Hibernation of birds;

It does not appear that birds in general are capable of undergoing this state of existence; but the instances of swallows that have been found in this state in old walls and hollow trees, and even, as some affirm, below water, and have recovered life and activity on being exposed to gradual warmth, are too well authenticated to admit a doubt, that these at least sometimes hibernate.

358 of reptiles and serpents;

Most reptiles and serpents pass the winter in a state of hibernation; but this is more particularly the case with the land tortoise (*testudo græca*), see ERPETOLOGY, p. 271.; frogs, and those lizards which inhabit cold climates.

359 of fishes;

It is not certainly known whether many species of fish become torpid in winter; but there is no doubt that several of them are susceptible of this state *; and we are told that in North America, especially about Hudson's bay,

* *Zoonomia*, vol i. § 19.

* *Reeve Dis Inaug. de Animalibus Hiemesopitis*, p. 10.

Of Sleep and Torpor. bay, fishes are not unfrequently found included within a body of ice, and when exposed to gentle heat, have recovered life and motion.

360 Of insects. Almost all insects remain, during the winter, in a torpid state. This happens principally to the chrysalids, and such grubs as cannot, in that season, procure their food.

361 Of man. It will appear extraordinary that we should place man among the hibernating animals; and yet there seems little doubt, that even he is capable of having his life suspended for a considerable time, when exposed to those causes which bring about the torpidity of those animals that we have already mentioned. We are told of a woman, who, in February 1789, remained eight days buried in the snow, and still recovered; and the case of the three women who remained for 37 days in a stable at Bergamoletto, that had been overwhelmed by an *avalanche*, or snow heap, with no other sustenance than the milk of a half-starved she goat, is well known. These instances, added to others of persons who have passed several weeks in a state of almost uninterrupted sleep, tend to prove that man himself may, under certain circumstances, continue in a torpid state.

362 Principal phenomena of hibernation. During this state of torpidity, the animals scarcely appear to live; sensation seems altogether lost; their irritability is so much diminished, that they may be cut, torn, or even broken to pieces, without expressing any mark of feeling, or giving any sign of motion; digestion seems entirely suspended; the secretions and excretions are discontinued. Some of the functions, however, are carried on. Respiration and circulation, though very languid, and sometimes scarcely perceptible, appear to go on in a degree sufficient to preserve the existence of the animal; and the action of the absorbents seems to be very little diminished, as appears from the gradual absorption of the fat. If the animal is taken from its place of confinement, and exposed to a gentle heat, it gradually recovers all its faculties; but if carried back to its cell, it relapses into the state of torpidity.

363 Suspended animation of some animals. The long suspension of animation, of which several animals are susceptible, appears still more extraordinary than the torpidity above described. The common hair worm (*gordius aquaticus*) may, when dried, be preserved for an indefinite length of time, and when put into water, gradually recovers its usual activity of motion. See HELMINTHOLOGY, N° 32. One of the most remarkable cases of this suspended animation is that related of the garden snail, of which the following curious account has been given in the Philosophical Transactions for 1774. Mr Stuckey Simon, a merchant in Dublin, whose father, a fellow of the Royal Society, and a lover of natural history, left to him a small collection of fossils and other curiosities, had amongst them the shells of some snails. About 15 years after his father's death (in whose possession they were many years), he by chance gave to his son, a child about 10 years old, some of these shells to play with. The boy put them into a flower-pot, which he filled with water, and the next day into a bason. Having occasion to use this, Mr Simon observed that the animals had come out of their shells. He examined the child, who assured him that they were the same he had given him, and said he had also a few more, which he brought. Mr Simon put one of them into water, and in an hour and a half after observed that it had put out its horns and body, which it moved but slowly, probably from weakness. Major Vallancey and Dr Span were afterwards present, and saw one of these snails crawl out, the others being dead, most probably from their having remained some days in the water. Dr Quin and Dr Rutty also examined the living snail several times, and were greatly pleased to see him come out of his solitary habitation after so many years confinement. Dr Macbride, and a party of gentlemen at his house, were also witnesses of this surprising phenomenon. Dr Macbride has thus mentioned the circumstance: "After the shell had lain about ten minutes in a glass of water that had the cold barely taken off, the snail began to appear; and in five minutes more we perceived half the body pushed out from the cavity of the shell. We then removed it into a bason, that the snail might have more scope than it had in the glass; and here, in a very short time, we saw it get above the surface of the water, and crawl up towards the edge of the bason. While it was thus moving about, with its horns erect, a fly chanced to be hovering near, and, perceiving the snail, darted down upon it. The little animal instantly withdrew itself into the shell, but as quickly came forth again, when it found the enemy was gone off. We allowed it to wander about the bason for upwards of an hour, when we returned it into a wide-mouthed phial, wherein Mr Simon had lately been used to keep it. He was so obliging as to present me with this remarkable shell; and I observed, at twelve o'clock, as I was going to bed, that the snail was still in motion, but next morning I found it in a torpid state, sticking to the side of the glass."

The still more extraordinary instances that have been related, on what many have considered authentic testimony, of toads having been found inclosed in the trunk of a large tree, or within a solid block of stone, appear almost incredible; and yet if we consider that M. Herissant preserved toads in a state of suspended animation for 18 months, in boxes covered with a thick coating of mortar (see ERPETOLOGY, p. 286.); that the snails mentioned in the above quotation, must have lain for at least 20 years; and that flies have been recovered after being immersed for many months in Madeira wine, it is difficult to say how long this suspended animation may not be continued.

Similar phenomena take place in the vegetable creation. Most of those plants which survive one year, shed their leaves on the approach of winter; and, during this season, the motion of the sap ceases, and they have all the appearance of dead shrubs. The herbaceous tribes even die down to the roots, which, being mostly of the bulbous kind, afford shelter to the surviving germ; and are hence called, by botanists, the *hybernacula* of plants. On return of spring, the plant shoots anew from its winter's retreat, and flourishes with its former strength and beauty. 364 Hibernation of plants.

Some plants are even capable of having their vitality, or rather the exercise of all their functions, suspended, as in the *gordius* and the snail, for an indefinite length of time. *Mosses* have been kept in a dried state in a *hortus siccus* for many years, and have shown no sign of life, till they were moistened and exposed to air, light, and a moderate heat, when they have recovered all their powers, have erected their stems, shot forth new branches, and flourished as at first.

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365 Theory of torpor.

It is almoſt impoſſible, in the preſent ſtate of our phyſiological knowledge, to give any rational theory of theſe phenomena. The torpor of animals has been attributed to exhauſted excitability, or exhauſted ſenſorial power; to the effects of habit, and to the effect produced on the brain by ſuſpended or diminiſhed reſpiration. The laſt of theſe, though not quite ſatisfactory, appears to us the moſt probable hypotheſis. It has been ably defended and illuſtrated by Dr George Kellie, in a paper in which he relates a remarkable caſe of torpor from cold.

"The powers of voluntary motion and of ſenſation (ſays Dr Kellie), are known to depend immediately upon the conditions of the brain and nerves; if, therefore, we could diſcover in what manner theſe organs are affected by any of the preceding events, we ſhould advance conſiderably towards the ſolution of the queſtions above ſtated. (*Namely, What is the order of ſucceſſion between the diminiſhed irritability of the heart, in conſequence of the abſtraction of caloric, and the complete torpor of the voluntary muſcles and of the organs of ſenſe, and how are the intervening effects connected?*) Were the inactivity of theſe organs the direct effect of their diminiſhed temperature; did the torpor in no caſe happen, till the heat of the brain and nerves was reduced beneath the natural ſtandard, there could be hardly ground for any farther inquiry. But, as it is not ſo, ſome other change, leſs direct, muſt have occurred, in conſequence of the connection of the brain with, and its dependence upon, ſome other of the functions antecedently and more immediately affected; and this function I apprehend to be reſpiration, between which and the energies of the nervous ſyſtem a very intimate connection is maintained, through the changes produced on the blood during the pulmonary circulation. This dependence of the brain upon the properties of the blood, maintained by reſpiration, is evinced by a great variety of obſervations. Whatever impedes the reſpiratory changes of the circulating fluid debilitates or deſtroys the powers of muſcular motion, as the reſpiration of noxious gaſes, of reduced or rarefied atmoſphere; while greater exertions of muſcular powers call for, and give occaſion to more frequent reſpiration, more rapid conſumption of air, and greater changes of the blood; and the breathing of more effective gaſes, as of the nitrous oxide, increaſes the motive and ſenſitive powers of animals. That theſe effects depend immediately upon the properties of the blood, as modified by reſpiration, acting on the brain, has, I think, been proved by the experiments of Bichat, who, in a maſterly manner, has traced the mutual connection and dependencies of the vital functions in his admirable *Recherches Phyſiologiques ſur la Vie et la Mort*. The transfuſion or injection of venous blood into the carotids induced aſphyxia or death, the inſtant it reached the brain; an effect which did not follow the ſimilar transfuſion of arterial blood from the carotid of another *. By theſe experiments, and by ſeveral other obſervations, he has ſhewn, that the aſphyxia which ſo inſtantly follows impeded or ſuſpended reſpiration is occaſioned by the impreſſion of dark, venous, unchanged blood upon the brain, and not, as has commonly been ſuppoſed, from this blood being incapable of ſtimulating the left ſide of the heart, which, on the contrary, continues to contract and to circulate the blood for ſome time after the voluntary functions are ſuſpended; an obſervation confirmed alſo by Coleman and others.

* *Bichat, Recherches*, part ii. art. 7.

"Such then appears to be the connection between the functions of reſpiration and thoſe of the brain. Now, in animals rendered torpid from cold, there are many obſervations which lead us to believe, that the immobility of the nervous ſyſtem depends much, and very directly too, on the ſtate of reſpiration.

"In the perfect torpor of the hibernating *amphibiæ*, reſpiration is completely ſuſpended, and the conſequent changes produced on the blood by that function totally prevented. This, which appeared from a variety of obſervations on the winter quarters of ſuch animals found imbedded in mud, incaſed in ice, or cloſed up in opercula of their own conſtruction, for the occaſion of excluding the air, has been amply confirmed by the pointed experiments of Spallanzani, lately publiſhed by Senebier†.

† *Mem. on Reſpiration.*

"In every caſe of torpor from cold, where the reſpiration falls ſhort of this complete ſuſpenſion, it is at leaſt more or leſs impaired. How much the torpid ſtate depends on this condition of the reſpiratory functions, farther appears from obſerving, that hibernating animals, even thoſe not of the amphibious order, warned by the approach of winter, inſtinctively or induſtriouſly ſeek ſituations unfavourable to perfect reſpiration, where this function may be either inadequately or not at all performed, as by premature and involuntary interment under ground, in old walls, in mud, at the bottom of lakes, &c. The inſtinct of theſe animals, too, has been finely imitated by experiment, illuſtrating at once the object of this inſtinct, and confirming the opinion here advanced of its tendency. Thus the dormant hamſter was found to regain and preſerve its activity, when freely expoſed to a pure atmoſphere, the temperature, at the ſame time, not exceeding that at which it had formerly become torpid, or at which it returned to that ſtate when again ſecluded under ground ‡. Theſe obſervations ſeem concluſive on this point, and, with thoſe already brought forward confirming the general connection eſtabliſhed between the properties of the blood, as modified by reſpiration, and the functions of the brain, render it, I think, highly probable, that the torpor of the voluntary powers, in the caſes now under conſideration, is the conſequence of a limited and imperfect reſpiration, antecedently induced by diminiſhed temperature.

‡ *Buffon's Nat. Hiſt.* by Smellie, vol. vii. p. 193.

"Obſervation, indeed, is more deficient on this point with regard to the higher orders of animals, and to men, who only occaſionally become torpid from cold. Yet more than analogy, which is here very ſtrong, leads me to believe that, even in theſe, the functions of reſpiration are much and neceſſarily affected. The examples of cattle and of men remaining long torpid, deeply buried under ſnow, are pretty direct and convincing proofs of this.

"If our induction from all theſe obſervations be admitted, we have the rudiments of a theory adequate to the explanation of the phenomena, in ſo far, at leaſt, as the torpor of the voluntary powers is concerned.

"From the ſuſpended or imperfect reſpiration, thoſe changes, by which the blood is fitted for maintaining the activity of the ſenſorial ſyſtem, are interrupted; this imperfect blood circulating ſlowly through the brain directly impedes its functions, and ſo debilitates the excitability of the motive and ſenſitive organs, that they become torpid. This enunciation may ſeem hypothetical; but let the proofs of the intimate connection between the reſpirable and ſenſorial functions be weighed; conſider

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conſider alſo the interrupted reſpiration of hibernating and torpid animals, their inſtincts with regard to this, and the greater facility with which torpor is induced in a confined ſituation, which they naturally ſeek; and compare all theſe with the obſervations and experiments of Bichat on the effects of the immediate impreſſion of venous blood upon the brain, and you will perceive a connected ſyſtem, not entirely fanciful, a theory not without foundation and ſtrength, and which appears to me at leaſt to merit ſome attention *."

* *Edin. Med. and Surg. Jou.* vol. i. p. 303.

For further particulars reſpecting the torpidity or hibernation of animals, we refer the reader to Spallanzani's *Tracts on Animals and Vegetables*; White's *Natural Hiſtory of Selborne*; Barton's *Fragments of the Natural Hiſtory of Pennſylvania*; Pennant's *Arctic Zoology*; La Cepede *on Oviparous Quadrupeds, as tranſlated by Kerr*; Townſon's *Tracts on Natural Hiſtory and Phyſiology*, and the *Inaugural Diſſertation of* Dr Reeve *de Animalibus Hieme Sopitis*, publiſhed at Edinburgh in 1803.

Chap. XVI. *Of Death.*

366 In the article Man, (N° 33. *to the end*) we have traced the progreſs of human life, from the *cradle* to the *grave*; and have briefly conſidered the phenomena and the conſequences of natural *death*. In that article, and Longevity, we have alſo ſtated the natural duration of human life, and the circumſtances that tend to prolong our exiſtence beyond the ordinary period. We ſhall not here enter again on any of theſe topics, except to give a more ample account of the gradual approaches of natural death, and ſhall then enumerate the cauſes which uſually produce *violent* or *accidental* death, and mention the opinions of ſome of the beſt writers on the *nature* of death.

367 Gradual approach of natural death.

Natural death is, in the preſent ſtate of civilized ſociety, by no means a common occurrence. When it does take place, its approach is ſlow and gradual. He whoſe life terminates in conſequence of advanced age, (to uſe the language of a celebrated French phyſiologiſt), dies in detail. His external functions ſucceſſively ceaſe to exert their action; all his ſenſes are ſucceſſively loſt, or the ordinary cauſes of ſenſation paſs over them without leaving their uſual impreſſions. The *ſight* becomes obſcure, and at length the humours of the eye no longer tranſmit the rays of light; the *ear* receives only confuſed ſounds, and frequently before death, is altogether inſenſible; the ſenſe of *touch*, in conſequence of the hardneſs and callouſneſs of the cuticle, and the obliteration of many of the ſubcutaneous veſſels, grows dull and uncertain; and all the parts depending on the ſkin ſhow marks of weakneſs; the hair and the beard grow white, and a greater or leſs degree of baldneſs takes place; odours are no longer perceived, or they are perceived but faintly. The taſte uſually ſurvives the reſt of the ſenſes; but that too, at laſt, grows equally obſcure. The functions of the brain partake of the imbecility of the external ſenſes. The imagination in particular becomes dull and often depraved; the memory no longer retains thoſe occurrences which are every day taking place, though it recalls with increaſed reliſh and delight thoſe of paſt times; the judgment becomes weak and wavering.

From the univerſal agency exerted by the nervous ſyſtem on all the animal functions, we muſt expect that when the former is impaired, the latter will be proportionally enfeebled. The faculties of locomotion and of ſpeech are commonly the firſt of theſe that fail; the body totters at every ſtep, the voice grows weak, and the tongue faulters. The motion of the limbs is difficult and painful, and hence is but ſeldom willingly exerted. Not ſo with the vocal organs, though the impediments to utterance are evident and painful to his hearers, the old man himſelf ſeems ſcarcely to attend to them, but talks with proverbial garulity, and eſpecially delights in recounting the ſcenes and actions of his youth.

While the external functions, and thoſe of the brain, are thus gradually impaired; the internal, or what are commonly called the vital and natural functions, as digeſtion, abſorption, circulation, reſpiration, and ſecretion, proceed with but little derangement. The circulation and reſpiration are indeed ſlower than before, and the appetite is in general leſs keen and returns leſs frequently; but the digeſtive powers of the gaſtric fluids remain in full vigour, and even after death has taken place, are exerted on the coats of the ſtomach; abſorption is alſo very active, and nutrition, at leaſt in many parts of the body, is ſufficiently evident. At length, however, all theſe functions loſe their powers; digeſtion languiſhes; the ſecretions no longer take place; the circulation, eſpecially in the minute veſſels, becomes obſcure, and being deprived of the tonic powers by which it was carried on, gradually ceaſes altogether; the heart no longer propels the blood from its ventricles; and the circulation through the lungs being thus arreſted, theſe organs ceaſe to take in air, make their laſt expiration, and thus the natural life of man is terminated †.

† See *Bichat Recherches Phyſiol.* part i. art. 10.

368 Accidental or violent death.

Accidental death takes place in one of the two following ways; either ſuddenly, in conſequence of ſome great diſturbance produced in the animal economy, as when a man is cut off by a ſudden ſtroke of apoplexy, violent hæmorrhage, *aſphyxia*, &c. or by ſlow and gradual ſteps, in conſequence of ſome leſs violent but ſtill fatal diſeaſe. In the former caſe, it is *ſudden* or *violent* death; in the latter *lingering* death.

Violent death may take place firſt, either in the *brain*, the *lungs*, or the *heart*; but when the action of one of theſe organs ceaſes, that of the others ſoon terminates. The entire ceſſation of life ſeems, however, to be more ſudden in the two latter caſes, and moſt of all in the laſt; when the *heart* is wounded or ruptured, the animal dies inſtantly; when the lungs are rendered inactive in conſequence of ſuffocation, the animal may live for ſeveral minutes, or for an hour or two; but when the *brain* is overwhelmed, he may ſurvive for hours or even days. Thus it ſometimes happens, in caſes of apoplexy, that the patient lies motionleſs, ſpeechleſs, and quite inſenſible to external ſtimuli, while the circulation and reſpiration continue, impeded indeed, but not deſtroyed, for a conſiderable time, though life, as appears from the event, be in a ſtate of irrecoverable declenſion. We ſhall preſently ſhow how theſe circumſtances have been explained.

369 Signs of approaching death.

The uſual ſigns of approaching death are, a very quick and ſmall pulſe, ſcarcely diſtinguiſhable, and commonly intermitting; coldneſs, and generally clammy ſweats about the extremities; a "lack luſtre" eye, ſunk in features, want of expreſſion about the countenance, and a prominence of the bones of the face, with a correſponding hollowneſs in the cheeks, orbits, and eſpecially

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especially at the temples. These last appearances constitute the marks of what has been called *facies Hippocratica*. They are all signs of a loss of activity and power in the circulating and nervous systems. Under these bodily circumstances, the powers of the mind seem to decline, generally with an equal pace with those of the body; and when the medium through which the activity of the soul is manifested can no longer act, we cannot expect to find any further traces even of its existence. Yet at the period of its separation, we are told of brilliant mental exertions of powers of intellect, not equalled in the best portion of existence. It has not been our fortune to see such intellectual animation. At the moment of death, anxiety for those we have loved will sometimes occasion apparently disproportioned exertions; and as they were unexpected, they have been exaggerated. But in no instance could we ever detect the activity of mind independent of the body. To this temporary prison the soul is confined, till, by the destruction of the machine, its animating principle is emancipated, soaring probably in higher, and, we trust, in more blissful, regions *.

* *New Lond. Med. Dict.* vol. i. p. 534.

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Signs or criterion of actual death.

A few cases have occurred, in which persons, who were thought dead, have recovered from what was really a state of *suspended animation*; and there is reason to believe, that some unhappy beings have been buried while in this seemingly lifeless state. It becomes, therefore, a matter of the highest importance to ascertain, with certainty, whether or not death has actually taken place. The ordinary signs of death, as enumerated by one of the latest writers on this subject, are as follows:

1. The *suspension of respiration*. 2. The *rigidity* of the limbs. 3. The *loss of sensation* and *motion*. 4. The *want of pulsation* in the heart and arteries. 5. The *spontaneous discharge of feces*. 6. The *collapse*, *opacity*, and *want of lustre* in the *eyes*. 7. The *coldness* of the body. 8. The *paleness* or *lividity* of the countenance. 9. The *relaxation* of the lower *jaw*. 10. The *regurgitation of liquids* to the mouth. 11. The *insensibility* of the *pituitary membrane* of the *nose*. 12. The *collapse*, *softness*, and *wrinkling* of the *lips*. 13. The *hollowness* of the *temples*, and *thinness* and *contraction* of the *nose*. 14. *Putrefaction* ‡.

‡ *Davis Reglement concernant les decés*, part ii.

Most of these signs singly have been shown to be fallacious; and none of them, except the last, are to be depended on with implicit confidence. Dr Davis recommends the following mode of procedure. "As soon as the evident signs of life cease, let us place the body in a warm or dry bed, give a proper temperature to the air of the apartment, and employ every means for restoring it to life. If we judge, from the nature of the disease which preceded the death, that these means are useless, we may content ourselves with keeping the body, until its decomposition become manifest; but let us never abandon an unfortunate person, who, perhaps by perseverance in the proper means, may be restored to life: should he recover, he will be a living monument of unexpected resurrection, and of the unceasing efforts of humanity. If a person die of malignant fever, scurvy, internal inflammation, or any other disease which corrupts the fluids, soon after death the belly becomes black and swelled; black or livid spots appear on the limbs and back, the eyes become hollow and soft, and discharge a puriform fluid; the eyelids grow yellow; the mouth opens, because the lower jaw is relaxed; the skin gets soft, the muscles flaccid; and, lastly, the whole body exhales a putrid odour. All these phenomena united, constitute an infallible proof of real death * (N)."

* *Ibid.*

The changes which the animal body undergoes in consequence of death, and during putrefaction, have been amply detailed and explained under CHEMISTRY, chap. xix. sect. 2.

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Comparative pertinacity of life.

In treating of the general phenomena of life in the first chapter of this article, we made a few observations on the degree of vitality that appears in various tribes of organized beings. There is scarcely a more curious part of the physiology of death than the consideration of the greater or less difficulty with which it is produced in different animals. Some, as the herring and the whiting, die almost instantly on being removed from the situation in which they usually live. Some are killed by a slight blow on the nose or the neck; this is the case with the seal, the rat, the hare, and the rabbit. Others again retain life with great pertinacity. Among the mammalia, the cat is proverbial for being difficult to kill; the sloth has been known to live for above 40 days clinging to a pole, and entirely without food; and Dr Sparrman assures us, that the ratel, or honey weazel (*viverra mellivora*), is so hardy that it is almost impossible to kill it; the colonists and Hottentots both assert, says he, that it is almost impossible to kill this creature, without giving it a great number of violent blows on the nose; and it is remarkable that such a number of hounds as are able collectively to tear in pieces a lion of moderate size, are sometimes obliged to leave the ratel only apparently dead †. Some fishes live for a long time after being removed from the water, and even after being gutted and cut in pieces, as the *carp*, the *flounder*, and the *eel*. It is among the reptiles, mollusca, and zoophytes, however, that we find the most remarkable instances of pertinacity of life. Referring the reader to the article ERPETOLOGY for these instances in reptiles, and to HELMINTHOLOGY for those in zoophytes, we shall here only mention two among mollusca. The sea marigold (*actinia calendula*) is destroyed with such difficulty, that after drilling the holes of the rock from which they appear, with an iron instrument, they have been known to rise again in the same places, and become as numerous as before in the course of a few weeks ‡. Snails whose remarkable suspended animation we have already recorded, may be crushed beneath the foot, and will yet survive, and repair the breaches in their shelly covering; nay, they are capable of passing the ordeal of boiling water, as we learn from the relation of a lady who, wanting some snail shells for a piece of grotto work, attempted to kill the animals by repeatedly pouring over them boiling water; but to her horror and astonishment, she observed them next day crawling about the edges of the vessel in

† *Sparrman's Voyage.*

‡ *Hughes's Nat. Hist. of Barbadoes.*

(N) The work of M. Bruhier, *sur l'Incertitude des Signes de la Mort*, from which these remarks of Dr Davis appear chiefly to be taken, created so much alarm in France, that every body dreaded being buried alive. To combat these terrors, M. Louis, in 1752, published his *Lettres sur la Certitude des Signes de la Mort*; in which he has very happily, and we think successfully, refuted the arguments of Bruhier, and has thereby relieved the minds of his readers from one of the most dreadful apprehensions that can appal us on this side the grave.

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in which ſhe had ſcalded them *. It is in vain for us to attempt any explanation of theſe extraordinary phenomena. We muſt refer them to ſome principle in the animal economy which is at preſent unknown.

* *Annual Regiſter*, vol. xvii. p. 86.

372 Cauſes of death.

The remote cauſes of death have been, by Dr Ontyd, arranged under 12 general heads, to which he gives the name of *claſſes*. Theſe we ſhall enumerate, with their principal ſubdiviſions.

I. Death ariſing from the mechaniſm of the body.

II. Death from the paſſions of the mind.

1. *Exciting paſſions*; 2. *Depreſſing paſſions*.

III. Death from ſuperabundance or deficiency of heat.

1. *From ſuperabundant heat*; 2. *From deficient heat*.

IV. Death from electricity.

V. Death from noxious gaſes.

1. *From hyperoxygenized gaſes*; 2. *From deoxygenized gaſes*; 3. *From peculiarly ſtimulating gaſes*.

VI. Death from poiſons.

1. *Animal poiſons*; 2. *Vegetable poiſons*; 3. *Mineral poiſons*.

VII. Death from univerſal diſeaſe.

1. *Fevers*; 2. *Febrile diſeaſes* (exanthemata).

Theſe ſeven claſſes are ſuppoſed to produce death by the immediate extinction of the *vital principle*; the five following are ſuppoſed to effect this by ſuppreſſing the action of ſome vital organ, or by diſordering the chain of the vital powers by deſtroying the action of ſome of the intermediate links.

VIII. Death from inflammations.

1. *Inflammations of the head*; 2. *Of the breaſt*; 3. *Of the belly*.

IX. Death from fluxes.

1. *Alvine fluxes*; 2. *Hemorrhages*.

X. Death from cachexies.

1. *Ulcers*; 2. *Atrophies*; 3. *Debilities and Privations*.

XI. Death from diſeaſes of the nervous ſyſtem.

1. *Atony*; 2. *Spaſm*.

XII. Death from diſeaſes of the ſecretory organs.

1. *From altered action*; 2. *From altered ſtructure* *.

* *Ontyd on Mortal Diſeaſes.*

373 How theſe operate.

The manner in which theſe cauſes operate in terminating life, is thus ſtated by the ſame author.

The cauſes of the *firſt claſs* act by inducing too great a rigidity of the ſolids, and by rendering them inſenſible to *ſtimuli*; the neceſſary effects of the continued action of the powers of *life*. In death from cauſes of the *ſecond claſs*, the perſon dies in conſequence of *apoplexy*, *ſyncope*, or *ſuffocation*, the brain, the heart, or the lungs being overwhelmed by accumulated blood. The cauſes of the *third claſs* act in a ſimilar manner with thoſe of the ſecond; that of the *fourth* by ſuddenly extinguiſhing the *vital principle*; thoſe of the *fifth* always act by inducing *ſuffocation*. The cauſes of the *ſixth* claſs act in *four* ways: 1. By aboliſhing the vital principle by the violence of their ſtimulus; 2. By deſtroying the action of the brain, the heart, or the lungs; 3. By producing mortification of the inteſtinal canal; 4. By ſecretly and inſenſibly deſtroying life. Thoſe of the *ſeventh* claſs act in *ſix* ways: 1. and 2. As in the laſt; 3. By local inflammation; 4. By *mortification* of ſome *vital organ*; 5. By a change in the organic ſtructure of the inteſtinal canal inducing a colliquative *diarrhœa*; 6. By *colliquative ſweats* waſting the body.

The cauſes of the *eighth* claſs act in *four* ways: 1. By inducing violent convulſions; 2. As in the two laſt; 3. By ſuppreſſing the action of ſome vital function from the violence of the inflammation; 4. By mortification. The *ninth* claſs may act in *five* modes: 1. By *ſpaſm*; 2. By fatal *ſyncope*; 3. By impeded action of ſome vital organ; 4. By mortification or *ſphacelus*; 5. By waſting the ſtrength in *fruitleſs exertions*. The *tenth* claſs may act in no leſs than *nine* ways: 1. By the conſumption of ſome vital organ, or deſtroying the tone of the whole body; 2. By the violence of the noxious ſtimulus; 3. By ſuffocation; 4. By apoplexy; 5. By *ſyncope*; 6. By hemorrhage: 7. By colliquative *diarrhœa*; 8. By mortification of ſome organ; 9. By malignant fever from abſorbed ichorous matter. The cauſes of the *eleventh* claſs act only in two ways: 1. By violent ſpaſm; 2. By apoplexy. Thoſe of the *twelfth* claſs, produce death in three modes: 1. By the ſlow effects of the noxious ſtimulus; 2. By the continually ſtimulating noxious power alone, or by this and the continual waſting of the blood, to form ſome peculiar ſecretion; 3. By impeding or deſtroying the function of a vital organ *.

* *Ontyd*, p. 637.

Many of theſe modes of operation are very ill defined, and they may all be reduced to about eight or ten, or perhaps even fewer.

374 Nature of death.

Death has been defined *the ſeparation of the ſoul from the body* †; the *extinction of the vital principle*; the *extinction of the faculty of anſwering a ſtimulus* ‡, &c. &c. Perhaps we cannot deſcribe it better than by calling it *the irrecoverable ceſſation of all the bodily functions*. By this character we diſtinguiſh it from *ſuſpended* animation and *lethargy*, in which *ſome* of the functions continue; while we acknowledge the ſurvival of the *immaterial part* of our frame.

† *Johnſon.*
‡ *Ontyd.*

It has been the general opinion among philoſophers, both of ancient and modern times, that death produces only a change of the elements or principles of the organized body; and does not effect the *annihilation* of any part. Modern chemiſtry has fully confirmed this opinion, and has ſhown that by putrefaction the body is diſſolved into a few *earthy*, *ſaline*, and *gaſeous* products, all capable of entering into new combinations, and thus conſtituting a part of future bodies. See Chemistry, N° 2572, and Man, N° 44.

Of all the writers on the nature and phenomena of death, with whom we are acquainted, none has treated the ſubject with ſuch accuracy and philoſophic method, as Bichat. With a ſummary of ſome of the leading principles of this able phyſiologiſt we ſhall cloſe the preſent chapter, and thus terminate our phyſiological enquiries.

375 Opinions of Bichat.

We have already mentioned Bichat's diviſion of life into *animal* and *organic*: ſee N° 49. Proceeding on the principle of this diviſion, he conceives that the two lives terminate in different ways, and that one often terminates while the other remains active. In the natural death that happens from old age, the *animal life* gradually ceaſes in the order we have deſcribed, N° 367, while the *organic* life remains. The ſame happens in thoſe caſes of violent death where life firſt ceaſes in the brain, this organ being the centre of animal life. In other caſes of violent or accidental death, the *organic* life firſt ceaſes in its central organs, the *heart* or the *lungs*; but in theſe caſes, the *animal* life alſo is ſpeedily ſuppreſſed.

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TABLE

OF THE MOST IMPORTANT CIRCUMSTANCES

RESPECTING THE

ORGANIC FUNCTIONS

OF THE

HUMAN BODY.

	I. SENSATION.	II. MOTION.	III. DIGESTION.	IV. ABSORPTION.	V. CIRCULATION.	VI. RESPIRATION.	VII. SECRETION.	VIII. REPRODUCTION.
1. ORGANS.	*Cerebrum, Cerebellum, Medulla Oblongata*, Spinal marrow, Nerves, Organs of Sense.	Muscles, Tendons, Bones, Cartilages, Ligaments, and Mucous bags.	Salivary glands, Mouth, Teeth, Gullet, Stomach and Intestines, Liver, Pancreas, and Spleen.	Lacteals, Lymphatics, Thoracic duct, Mesenteric glands, Lymphatic glands, Skin.	Heart, Arteries, Veins, and Exhalants.	Nostrils, *Larynx*, Windpipe, Lungs, and *Diaphragm*.	Salivary glands, Liver, Pancreas, Kidneys, *Testes*, Mucous glands, Membranes, &c. Miliary glands, Brain?	*Penis*, Testicles, *Vesiculae Seminales*, Prostate gland, Spermatic vessels in Man; *Vulva*, *Vagina*, *Uterus*, and the *Mammae*, in Woman.
2. FLUIDS.	Lymphatic and Gelatinous fluids, Nervous fluid?	Gelatinous fluid, *Synovia*, Marrow, Lymph, and Blood.	Saliva, Gastric juice, Pancreatic juice, Bile, *Mucus*.	Chyle, Lymph, Serous fluid.	Blood, Lymph, and various exhaled and secreted fluids.	Blood and *Mucus*.	Tears, *Mucus*, *Saliva*, Gastric juice, Pancreatic juice, Bile, Lymph, Synovia, Fat, Marrow, *Cerumen*, Semen, Urine, Milk, Nervous fluid?	Semen, Mucous fluid, Prostatic fluid, *Liquor amnii*, and Milk.
3. PHENOMENA.	Sensation, Action of external bodies on Man, and Perception of these Actions.	Contraction, Dilatation, Locomotion, Progression. Action of Man on external objects.	Mastication, Deglutition, Digestion in the stomach and intestines. Mutual Action of Alimentary substances and the Digestive organs.	Imbibition, Action of the Lymphatic vessels and glands on the fluids, Separation of noxious or useless matters, and Selection of useful substances.	Contraction, Dilatation, Pulsation, Exhalation, Nutrition.—Mutual action between the Blood and Circulating fluids.	Purification of the fluids, Renewal of action, Animal heat, Mutual action between the air and the animal solids and fluids.	Separation of fluids useful in the economy, and Expulsion of noxious or useless parts.	Copulation, Conception, Parturition, Lactation.
4. POWERS.	Sensibility and Vital resistance.	Irritability, Contractility, and Vital resistance.	Dissolution, Assimilation, and Vital resistance.	Irritability, Contractility, Assimilation, and Vital resistance.	Elasticity, Irritability, Contractility, Dilatability, and Vital resistance.	As in CIRCULATION.	Various.	Generative power.
5. RELATIVE PREDOMINANCE.	Most predominant in *infancy*; *female sex*; *melancholic temperament*; *hypochondriac*, *hysteric*, and other nervous affections, and in warm climates.	In *manhood*; in the *male sex*; the *sanguine temperament*, and in mountainous countries.	In *infancy*; in the *female sex*; in the *sanguine temperament*; in cold weather and cold climates.	In *childhood*; in the *sanguine* temperament; in *warm* climates; and during *sleep*.	In *childhood*; in the *female sex*; in the *sanguine temperament*; in warm countries; and in *febrile* and *inflammatory* affections.	Much as in CIRCULATION.	In middle age; various as to sex and temperament; in warm climates.	In *youth*; in those of a sanguine temperament, and lively imagination.
6. PRINCIPAL MORBID AFFECTIONS.	*Vertigo*, *Coma*, *Delirium*, Insanity.—Pain, Itching, Want of feeling; *Anaesthesia*; *Tinnitus aurium*, Deafness; Intolerance of light, *Diplopia*; *Caligo*, *Amaurosis*.	Spasm, Convulsion, Twitching, *Paralysis*.	*Bulimia*, *Pica*, *Nausea*, *Flatus*, Eructation, Rumination, Vomiting, Heartburn, *Pyrosis*, *Anorexia*.	Glandular obstruction, Atony of lymphatics.	General fever, Palpitation, *Plethora*, Inanition, Debility, Syncope.	Yawning, Sighing, Sobbing, Hiccup, Sneezing, Coughing, Anxiety, *Dyspnoea*, *Stertor*, *Asphyxia*, Dumbness.	Increased secretion, Diminished secretion, Depraved secretion, Jaundice, *Calculus*, &c.	*Priapismus*, *Satyriasis*, *Nymphomania*, *Menorrhagia*, *Amenorrhoea*, Impotence, Sterility.

Of Death.

It is to violent or accidental death that Bichat principally confines his discussions, and in order to determine with precision the phenomena that take place in the three species, he examines at great length the relations that subsist among the three functions of circulation, respiration and sensation, as they are affected by the death of the *heart*, the *lungs*, or the *brain*. He first considers those cases of sudden death that commence with the death of the heart; then those originating in the lungs; and lastly those originating in the brain. He shows how, one of these functions ceasing, the others successively stop; he points out the mechanism, by which the death of all the parts follows that of the organ first affected; and he determines, according to his own principles, the nature of the several diseases by which the life of the heart, the lungs, or the brain, is extinguished *.

We consider this as the most interesting part of his valuable work, and it well deserves the attentive perusal of every medical man. We regret that we cannot do more than extract from it the view given by the author of the successive phenomena produced by the influence which the death of each of the vital organs exerts on the general death of the body.

376 Progress of death commencing in the heart.

Whenever the heart ceases to act, says Bichat, general death comes on in the following manner. The action of the brain ceases for want of excitation; and from the same defect, the sensation, locomotion and speech, which immediately depend on the general sensorium, are interrupted. Besides, for want of the excitation of part of the blood, the organs of these functions would cease to act, even though the brain were supposed capable of exerting on them its usual influence. The whole of the animal life, then, is suddenly arrested. The man, from the moment that his heart dies, ceases to exist with respect to surrounding objects.

The interruption of *organic* life, which has commenced through the circulation, operates at the same time through the respiration. The mechanical actions of the lungs no longer proceed when the brain ceases to act, since on this organ depends the action of the diaphragm and intercostal muscles. The chemical changes can no longer take place, when the heart can neither receive nor convey the materials necessary for their developement. In short, general death continues to proceed in a gradual manner, by the interruption of *secretion*, *exhalation*, and *nutrition*. These are the effects produced when death is the consequence of a wound of the heart or large blood-vessels, a rupture of the heart, or similar accidents †.

377 Progress of death commencing in the lungs.

The series of phenomena that take place in death, as commencing in the lungs, is different according as the *mechanical* or the chemical action of these organs is first arrested. I. In the former case, as when death is produced by an extensive wound or laceration of the diaphragm, by the fracture of a great many ribs at the same time, &c. they proceed as follows: 1. Cessation of the mechanical action; 2. Cessation of the chemical phenomena, for want of the air which supported them; 3. Cessation of the brain's action for want of the red blood by which it was excited; 4. Interruption of animal life, of sensation, locomotion, and speech, from the loss of the exciting powers of the brain and the red blood on the organs of those functions; 5. Stoppage of the *general* circulation; 6. Stoppage of the circulation in the capillaries, of secretion, absorption, exhalation, for want of the excitation exerted on their organs by the red blood; 7. Cessation of digestion, for want of secretion, and of excitation of the digestive organs. II. When the chemical action of the lungs is interrupted, as when an animal is confined in a *vacuum*; in cases of *strangulation*, *suffocation*, *drowning*, &c. the phenomena of death proceed in the following order: 1. Interruption of the chemical phenomena; 2. Consequent suspension of action in the brain; 3. Cessation of sensation, voluntary motion, voice, and the mechanical functions of respiration; 4. Stoppage of the heart's action, and of the general circulation; 5. Termination of the capillary circulation, of secretion, exhalation, absorption, and, by consequence, of digestion; 6. Cessation of animal heat, which, being the result of all the functions, must cease when all these are terminated ‡.

378 Progress of death commencing in the brain.

The phenomena of general death commencing in the brain come on in the following series: 1. Cessation of the brain's action; 2. Sudden interruption of sensation and voluntary motion; 3. Simultaneous paralysis of the diaphragm, and intercostal muscles; 4. Interruption of the mechanical phenomena of respiration, and, by consequence of voice; 5. Cessation of the chemical phenomena; 6. Passage of the *black* blood into the system of *red* blood; 7. Impeded circulation, from the action of the black blood on the heart and arteries, and from the immobility of all the parts, especially the organs of the chest; 8. Death of the heart, and stoppage of the general circulation; 9. Simultaneous interruption of organic life, especially in the parts that are usually penetrated by red blood; 10. Abolition of animal heat §.

379 Conclusion.

We have now gone through the series of physiological enquiries, into which we proposed to enter in this article. In forming an estimate of the merit due to our labours, we request that our readers will consider the article as in a great measure supplemental to many that have preceded it in the course of the present work. It has been our principal object to fill up blanks and supply deficiencies, especially with respect to *Comparative Physiology*; and to form, with those preceding articles which have a reference to the *animal economy*, particularly ANATOMY, MEDICINE, MIDWIFERY, CHEMISTRY, MAN, one *connected*, if not *uniform* whole. The difficulty of the task we had undertaken will probably be admitted as some apology for the imperfect execution of it; while the variety and interesting nature of the subjects which we have treated, with the numerous references to the most respectable sources of information, will, we trust, render this article acceptable both to the general and the scientific reader.

* *Recherches*, part ii. art. 1.

† *Id.* art. 5.

‡ *Id.* art. 9.

§ *Id.* art. 13.

EXPLANATION

EXPLANATION OF PLATE CCCCXVIII.

Fig. 1. *Exhibits a view of the exit from the head, and distribution in the chest, of the great sympathetic nerve, intended to illustrate the mutual relations between the head and the principal organs of the chest and belly.*

A. The right *parotid gland* laid bare.

B. The *submaxillary gland.*

C, D, E, The *digastric muscle*, partly covered by the *submaxillary gland.*

F. Part of the *thyroid gland.*

G, G. The *œsophagus* or gullet.

H, H. The wind-pipe or *trachea.*

II. III. IV. V. VI. VII. The bodies of the six lower *vertebræ* of the neck; VIII. IX. the two first vertebræ of the back.

I, K, L. The heart, with part of the pericardium attached.

p, p. The arch of the aorta, drawn aside.

q. The common trunk of the right subclavian (*s*) and right carotid (*r*) arteries.

P. The *vena cava* from the *superior* parts; Q. That from below.

R, S, T. The right lobe of the lungs.

U, V. Part of the left lobe.

W, X, Z. Muscular parts of the *diaphragm.*

a. The first cervical or great *ganglion*, from which proceed, *b.* The trunk of the great sympathetic nerve, and *c.* The eighth pair of nerves, or *par vagum.*

d. The lower cervical *ganglion*, opposite the fifth cervical *vertebra.*

e. The upper thoracic *ganglion*, opposite the first vertebra of the back.

f. The third dorsal *ganglion*, between the second and third rib.

g. The *accessory nerve* of Willis.

h, i, k, l. Trunks of some of the cervical nerves.

m. The *cardiac plexus* formed by branches from the sympathetic nerve.

n, n. The *par vagum* running down to the *diaphragm*, through which it passes, unites with the *intercostal*, forms various *ganglia*, and gives branches to most of the abdominal *viscera.*

o, o. The *phrenic* nerves distributed to the *diaphragm.*

Fig. 2. A section of the cuticle of the *lilium chalcedonicum*, to shew the *lymphatic vessels*, much magnified.

Fig. 3. A similar magnified view in the *onion.*

Fig. 4. Ditto in the *pink.*

Fig. 5. Represents the atlantal extremity of the slow lemur (*lemur tardigradus*), to show the curious division of the *subclavian* artery.

a. The subclavian artery, lying upon the *subscapularis* muscle.

b. The division of the artery into equal-sized cylinders.

c. The ulnar artery proceeding to divide in the usual manner.

Fig. 6. Represents the sacral extremities of the same animal, showing a similar division of the inguinal artery.

a. The *diaphragm.*

b. The descending *aorta.*

c, c. The iliac *arteries.*

d. The trunk of the *inguinal* artery, situated among the cylinders.

e. The femoral artery under similar circumstances.

The annexed Table sufficiently explains itself.

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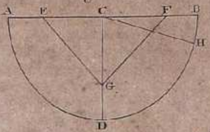
PHYTOLACCA,

Fig. 1.



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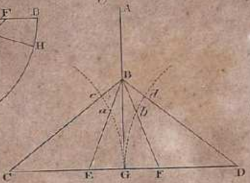

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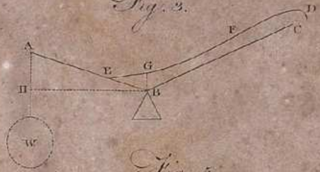

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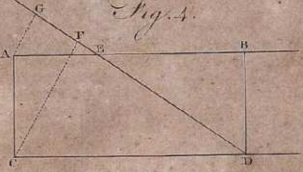

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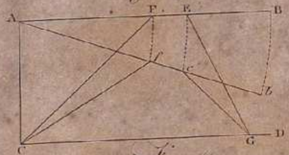

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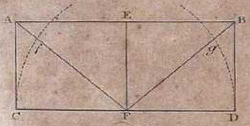

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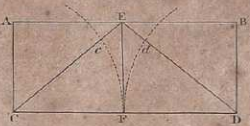

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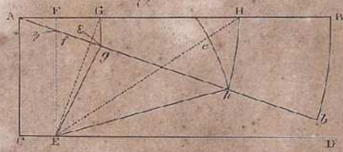

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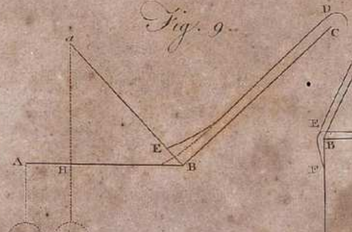
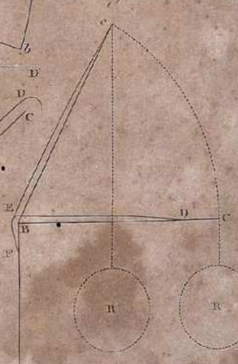


Fig. 10.



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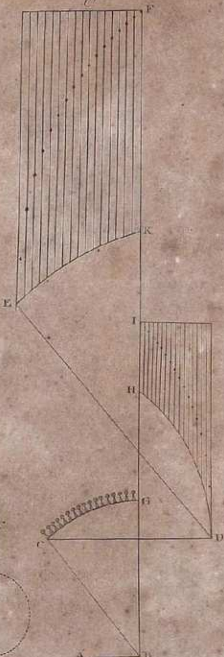


Fig. 1.

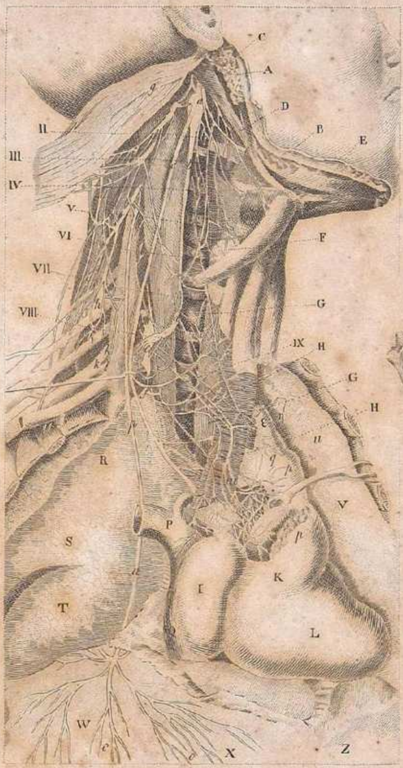


Fig. 2.

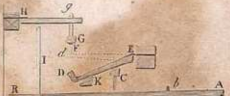
Fig. 3.

Fig. 4.

Fig. 6.

Fig. 5.

PIANO FORTE KEY



PHYTOLACCA, Pokeweed, or *American Nightſhade*, a genus of plants belonging to the decandria claſs. See Botany *Index*.

PHYTOLOGY, a diſcourſe concerning the growth, kind, and virtues of plants. See Botany, and Materia Medica.

PHYTON, a general of the people of Rhegium againſt Dionyſius, the tyrant of Sicily. He was taken by the enemy, and tortured, and his ſon was thrown into the ſea. See Syracuse.

PIA mater, a thin membrane which covers the brain and is in immediate contact with it. See Anatomy *Index*.

PIABA, in *Ichthyology*, is a ſmall freſh-water fiſh caught in all the rivers and brooks in the Braſils, and in ſome other parts in America. It is about the ſize of the common minow.

PIABUCU, in *Ichthyology*, is an American fiſh, eaten in many places by the natives. It is ſaid to be ſo ravenous, and greedy of blood, that if a perſon go into the water with a wound in any part of his body, the piabucu will make up to it to ſuck the blood. It ſeldom exceeds four inches in length.

PIACENZA is a city of Italy, in the duchy of Parma, in E. Long. 10. 25. N. Lat. 45. It is a large handſome city, whoſe name is derived by ſome from its pleaſant ſituation, in a fruitful plain, on the Via Æmilia, about half a mile from the Po. It is the ſee of a biſhop ſuffragan of Bologna, and has a univerſity, but of no great fame. It is defended by a wall and a ſtrong citadel, and is reckoned about three miles in circumference, ſo that it is ſomewhat bigger than Parma. The houſes are low, but well built; the great ſtreet, called the *Stradone*, is in a direct line and of equal breadth, with a foot-way fenced with poſts on each ſide like London, and is about 3000 feet long. The houſes are generally built of brick, and ſome of them are prettily painted. The cathedral is an old ſtructure, but well adorned within. The duke of Parma, who is ſovereign of Piacenza, has a palace in the city built by Vignola. There are many excellent paintings in this place. There are two chapels painted, one with the hiſtory of St Catharine, and the other with a picture of Chriſt, as alſo the altar of the church of St Auguſtine, all by Pordenone. In the ſame church there is a fine picture of the bleſſed virgin, St Peter, and St Paul, by Paolo Veroneſe. At the Capuchins there is a Francis by Guercino. There is a fountain ſaid to have been erected here by Julius Cæſar, and the equeſtrian ſtatues of the famous general Alexander I. duke of Parma and Placentia, and of his ſon Ranuccio, both in the great ſquare. In the palace of Scotti, there are a great many fine pictures by Lanfranco, who had been a page in their family, and among the reſt the rape of Helen, the taking of Troy, the bleſſed virgin, and St Francis. The trade of this city conſiſts chiefly in their cheeſe, as at Parma, theſe cities being ſurrounded with the richeſt paſture grounds in Italy; though the greateſt part of what is called Parmeſan cheeſe is made in the duchy of Milan, and particularly at Lodi. See *Parmeſan Cheese*.—Without the walls, which are waſhed by the rivers Trebbia and Po, there is a large ſeminary or college, magnificently erected by Cardinal Alberoni, a native of this city, but conſiderably hurt by the modern Goths in the laſt war. Towards the north of the city is the mouth of the river Trebbia, famous for the victory which Hannibal obtained over the Romans.

PIANO Forte, or Forte Piano, is a muſical inſtrument, which is too well known to require any detailed deſcription. We ſhall here, however, notice ſome of its peculiarities. The voice, it has been obſerved, is the original muſical inſtrument; of this all other inſtruments are to be conſidered but as imitations; and it is remarkable with what promptitude, as well as accuracy, the voice of man obeys the impulſe of the heart. Even a coarſe ear is hurt by an error in its tone, amounting to what is called a *comma*; and a limited voice can execute melodies which include 12 notes, or an octave and a fifth. Between theſe extremes the motion of the glottis does not amount to one twelfth of an inch, which muſt therefore be divided by the moſt ordinary finger into more than 1000 parts. All this too, without any ſeeming effort of thought, is done in an inſtant, and repeated with rapidity, without miſtaking one of the diviſions.

The great object in the conſtruction of muſical inſtruments is, to bring them as near as poſſible to expreſs the ſounds produced by the human voice: the violin, however, and a few of the ſimple wind inſtruments, are the only ones found fully to expreſs thoſe momentary gradations of ſentiment, and thoſe tender and delicate emotions with which the heart is agitated. For the purpoſe of removing this defect of harmonic inſtruments, the ſwell was added to the organ. Similar improvements were alſo attempted on other inſtruments of the ſame kind, and in the ſame way. The harpſichord was ſhut up like the ſwell organ, and was opened by means of pedals, when the performer wiſhed to enforce the ſound. But as this was found not to ſucceed well, other methods were tried, and in particular uniſons were added to each note, which were brought on, either by means of pedals, or by another ſet of keys; and in this way the power of the harpſichord was greatly improved. Among all the keyed inſtruments, the Engliſh piano forte ſeems to merit the preference, on account of the ſuperior force of tone, adequate ſweetneſs, and great variety of voice, of which, by the ingenuity of Britiſh artiſts, it has now become ſuſceptible. It has been called a national inſtrument, becauſe it is ſaid to be an Engliſh contrivance, the invention of the celebrated poet, Maſon. Mr Maſon had ſeen ſome attempts that were made by the Germans to make keyed dulcimers, which were in ſome meaſure ſuſceptible of the *forte* and *piano*; but as they were all conſtructed on one principle, and required a particular touch of the finger, which was of difficult acquiſition, and which ſpoiled it for harpſichord practice; as they were alſo deficient in delicacy and juſtneſs; and as the performer was by no means certain of producing the very ſtrength of ſound intended, Mr Maſon removed all thoſe imperfections, by detaching the mallet entirely from the key, and giving them only a momentary connection. It is by this improvement that the Engliſh piano forte is diſtinguiſhed from all others. Mr Maſon's general principle may be fully underſtood by the following deſcription. In the figure on Plate CCCCXVIII. the parts are repreſented in their ſtate of inaction. The key ABK turns, as uſual, on the round edge of the bar B, and a pin *b*, driven into the bar, keeps it in its place.

Piano Forte.

The dot F repreſents a ſection of the ſtring. ED is the mallet, having a hinge of vellum, by which it is attached to the upper ſurface of the bar E. At the other end is the head D, of wood, covered with ſome folds of prepared leather. The mallet lies in the poſition repreſented in the figure, its lower end reſting on a cuſhion-bar K, which lies horizontally under the whole row of mallets. The key AR has a pin C, tipt with a bit of the ſofteſt cork or buckſkin. This reaches to within $\frac{1}{40}$th of an inch of the ſhank of the mallet, but muſt not touch it. The diſtance E *e* is about $\frac{1}{3}$d or $\frac{1}{4}$th of the length of the ſhank. When the end A of the key is preſſed down on the ſtuffing (two or three thickneſſes of the moſt elaſtic woollen liſt) it raiſes the mallet, by means of the pin C, to the horizontal poſition E *d*, within $\frac{1}{8}$th or $\frac{1}{10}$th of an inch of the wire F; but it cannot be ſo much preſſed down as to make the mallet touch the wire. At the ſame time that the key raiſes the mallet by means of the pin C. it alſo lifts off the damper G (a bit of ſpunge) from the wire. This damper is fixed on the end of a little wooden pin G *g*, connected with the lever *g* H, which has a vellum hinge at H. This motion of the damper is cauſed by the pin I, which is fixed into the key near to R. Theſe pieces are ſo adjuſted, that the firſt touch of the key lifts the damper, and, immediately after, the pin C acts on the ſhank of the mallet. As it acts ſo near to its centre of motion, it cauſes the head D to move briſkly through a conſiderable arch D *d*. Being made extremely moveable, and very light, it is thus *toſſed* beyond the horizontal poſition E *d*, and it ſtrikes the wire F, which is now at liberty to vibrate up and down, by the previous removal of the damper G. Having made its ſtroke, the mallet falls down again, and reſts on the ſoft ſubſtance on the pin C. It is of eſſential importance that this mallet be extremely light. Were it heavy, it would have ſo much force, after rebounding from the wire, that it would rebound from the pin C, and again ſtrike the wire. For it will be recollected, that the key is, at this time, down, and the pin C raiſed as high as poſſible, ſo that there is very little room for this rebound. Leſſening the momentum of the mallet by making it very light, making the cuſhion at the top of the pin C very ſoft, and great preciſion in the ſhape and figure of all the parts, are the only ſecurities againſt the diſagreeable rattling which theſe rebounds would occaſion. In reſpect to the ſolidity and preciſion of workmanſhip, the Britiſh inſtruments are unrivalled, and vaſt numbers of them have been ſent to all parts of the continent.

As the blow of ſo light a mallet cannot bring much ſound from a wire, it has always been found neceſſary to have two ſtrings for each note. Another circumſtance contributes to enfeeble the ſound. The mechaniſm neceſſary for producing it makes it almoſt impoſſible to give any conſiderable extent to the belly or ſound board of the inſtrument. There is ſeldom any more of it than what occupies the ſpace between the tuning pins and the bridge. This is the more to be regretted, becauſe the baſſes are commonly covered ſtrings, that they may be of a moderate length. The baſs notes are alſo of braſs, which has a conſiderably lower tone than a ſteel wire of the ſame diameter and tenſion. Yet even this ſubſtitution for ſteel in the baſs ſtrings is not enough. The higheſt of them are much too ſlack, and the loweſt ones muſt be loaded, to compenſate for want of length. This greatly diminiſhes the fulneſs, and ſtill more the mellowneſs and diſtinctneſs of the tone, and frequently makes the very loweſt notes hardly appreciable. This inequality of tone about the middle of the inſtrument is ſomewhat diminiſhed by conſtructing the inſtrument with two bridges; one for the ſteel, and the other for the braſs wires. But ſtill the baſs notes are very much inferior to the treble.

Piano Forte, Piaſtus.

PIASTUS, a native of Poland, was originally a wheelwright, and the ſon of Coſſiſco, a citizen of Cruſwitz. He flouriſhed in the year 830, when on the extinction of the family of Popiel great diſputes aroſe about his ſucceſſor, and Cracow was afflicted with a ſevere famine. During this extremity, when the people were dropping down in the ſtreets, two angels in human forms, as the ſtory is told, took up their reſidence with Piaſtus, who was celebrated for his piety and extenſive charity. He had nothing left but a ſmall caſk of the common liquor of the country, and this he preſented to his new gueſts, who, charmed with his hoſpitality, promiſed him the crown of Poland. The faith of Piaſtus was equal to his other virtues: he implicitly believed the word of his gueſts, and piouſly followed their directions in every particular. He was ordered to diſtribute the liquor out of his little caſk to the multitude: he did ſo, and found that it was inexhauſtible. The people were aſtoniſhed; all cried out, "A miracle!" and the electors determined to chooſe a perſon in whoſe favour Heaven had ſo viſibly declared: Piaſtus was accordingly taken from his ſhop, and raiſed to the ducal dignity.

Mod. Univ. Hiſtory, vol. xxx. p. 336, &c.

Such is the relation of the canon of Cracow, which differs in many particulars from the account given by Guagnini, and ſeveral other hiſtorians. According to them, Piaſtus had prepared a ſmall collation, to entertain ſome friends who were aſſembled at the birth of a child. Two pilgrims, Paul and John, afterwards murdered at Rome, came about this time to Cracow. They begged charity at the door of the election-hall, and were rudely repulſed; upon which they ſtumbled on the houſe of Piaſtus, and were kindly received. The miracle we have mentioned was wrought by them; and the two pilgrims, and not angels, were the inſtruments of the elevation of the hoſpitable wheelwright. Though we pay but little regard to the marvellous means by which Piaſtus aſcended the ducal throne of Poland, it would be preſumptuous entirely to omit a fact atteſted by all the writers upon this ſubject: it was proper, therefore, to take notice of it, and we leave the reſt to the reader's judgment.

Being now raiſed to the ſupreme dignity, he was not intoxicated with his proſperity. His natural charity, benevolence, and ſweetneſs of diſpoſition, remained: nothing was altered but his power of doing good. He was truly called the father of his people: the injured never returned unredreſſed, nor merit unrewarded. Piaſtus wiped the tear from the eyes of the widow; and was himſelf the guardian of the orphan, and the general patron of the poor and diſtreſſed. His excellent inclinations ſerved him in the room of great abilities; and the happineſs that his people enjoyed made them forget that their prince was not born a ſtateſman and a warrior. Several inteſtine commotions aroſe during his adminiſtration, all which he quelled by the mildneſs and clemency of his nature: his nobility were

aſhamed

ashamed of rebelling against a sovereign who devoted his whole life to render his people happy. He removed the court from Cruswitz, a city which he detested, because it was the scene of Popiel's crimes and tragical end, and fixed his residence at Gnesna, where he died beloved, esteemed, and even adored by his subjects.

It is in memory of this excellent prince, that all the natives of Poland, who have been since promoted to the ducal or regal dignity, were called Piastes, in contradistinction to the foreigners.

Piastus associated his son Ziemovitus with him in the government before his death; a circumstance of much benefit to the people.

PIAZZA, in building, popularly called *piache*, an Italian name for a portico, or covered walk, supported by arches.

The word literally signifies a broad open place or square; whence it also became applied to the walks or porticoes around them.

PIBROCH, says Dr Beattie *, is a species of tune peculiar, I think, to the Highlands and Western isles of Scotland. It is performed on a bagpipe, and differs totally from all other music. Its rythm is so irregular, and its notes, especially in the quick movement, so mixed and huddled together, that a stranger finds it almost impossible to reconcile his ear to it, so as to perceive its modulation. Some of these pibrochs, being intended to represent a battle, begin with a grave motion resembling a march, then gradually quicken into the onset; run off with noisy confusion and turbulent rapidity, to imitate the conflict and pursuit; then swell into a few flourishes of triumphant joy; and perhaps close with the wild and slow wailings of a funeral procession.

* *Essay by Dr Beattie*, 8vo edit. p. 422. note.

PICA. See Corvus, Ornithology *Index*.

PICA Marina. See Hæmatopus, and Alca, Ornithology *Index*.

Pica, in *Medicine*, a depravation of appetite, which makes the patient long for what is unfit for food, or incapable of nourishing; as chalk, ashes, coals, plaster-lime, &c. See Medicine *Index*.

Pica, or *Pye*, had formerly the same sense as *ordinal*, meaning a table or directory, pointing out the order in which the devotional services appointed for different occasions were to be performed. Accordingly we are told it is derived from πι, a contraction of πιναξ, *a table*; and by others from *litera picata*, a great black letter at the beginning of some new order in the prayer. The term was used in a similar sense by officers of civil courts, who called their kalendars or alphabetical catalogues directing to the names and things contained in the rolls and records of their courts the *pyes*.

Pica, or *Picus, John*, prince of Mirandola and Concordia, was born in the year 1463, under the pontificate of Pius II. He was the youngest son of John Francis of Mirandola, and Julia, a lady of the noble family of Boiard. Some of the credulous historians of the time have related, that at his birth a globe of fire was seen to rest upon his mother's bed, portending, say they, by its shape the perfection of his genius, and by its element, the celestial turn of his mind. As soon as he was capable of receiving instruction, he was placed by his mother's care under the most able masters, and very early distinguished himself by the vigour of his application, and the strength of his memory; of which such prodigies are related as would be very difficult to credit, were we not assured by some modern instances, of the perfection to which that faculty may be carried. At the age of fourteen he was sent by his mother's direction, who was desirous that he should assume the clerical functions, to Bologna, at that time the principal resort of those who studied the pontifical law. After spending two years there, he became disgusted with this pursuit, although such was his industry, even at that early age, that he compiled an epitome of the pontifical epistles or decretals. His disposition, however, strongly led him to the pursuit of philosophy, with an eager curiosity to penetrate the secrets of nature and science: with this view he travelled over Italy and France, visited the most celebrated schools of each, and studied under the most famous teachers of both countries. After seven years spent in this course of instruction, and at the age of twenty-three, he went to Rome, and, after the fashion of the scholars of that time, brought himself into notice by publicly proposing literary questions for disputation. This sort of challenge was very common in that age, and, when printing was scarcely practised, and the name of a man of learning less rapidly extended than it is now, was almost the only method that a person of superior attainments had to make himself known. Mirandola proposed 900 questions, or as they were called *conclusiones*, in dialectics, mathematics, natural philosophy, and divinity, drawn not only from the stores of the Latin and Greek, but from the mysteries of the Hebrews and the arcana of the Chaldeans and Arabians. In addition to the endless topics of metaphysics, theology, and the ordinary subjects of disputation, into which he entered very profoundly, the *conclusiones* involved the ancient and obscure philosophy of Pythagoras, Trismegistus, and Orpheus; the doctrines of the Cabala, or mystic interpretation of the sacred writings, according to the Hebrews, taught by Origen and Hilarius; the extent, uses, and learning of natural magic, which was vindicated from the vulgar reproach of impiety and necromancy. Seventy-two new physical and metaphysical dogmata of the author's invention were likewise proposed and defended. These propositions, according to the ostentatious practice on these occasions, were fixed in the most public places in Rome, and the proposer engaged to defray the expences of any one who should come from a distance for the purpose of disputing with him. This challenge did not bring forward any disputants, but exposed Mirandola to much envy and jealousy, particularly from the professors of science at Rome, who felt the reflection that would be cast upon their credit by their declining a competition which they durst not encounter. Unable to injure his fame as a scholar, they made a much more dangerous attack upon the soundness of his faith; thirteen questions were selected, which were charged with the terrible suspicion of heresy and contempt of the ordinances of the church; a suspicion very readily listened to by the church when directed against great learning, which the increasing influence of philosophy and letters began to make her watch with extreme jealousy. Mirandola repelled this attack by publishing his Apologia, or Defence of the accused Propositions; which if he did not effectually clear away the suspicions he had incurred, tended to confirm his enemies in their dread of his learning and powers; and it must be owned that, overlook-

ing the miſapplication of talents to ſuch ſubjects, the Apologia exhibits a command of profound and well digeſted learning and keen argument, truly aſtoniſhing at the age of twenty-three. This work, and the diſcuſſions it contained of certain delicate points, added to ſome hints of the limit of pontifical controul in matters of faith, were ſo diſagreeable to Pope Innocent VIII. that he interdicted the reading both of the Apology and the diſputed queſtions. The love of glory, however, was not Mirandola's only paſſion: his youth, ſplendid accompliſhments, and the graces of his perſon, for which he is ſaid to have been remarkable, attracted the admiration and careſſes of many diſtinguiſhed Roman ladies, who united the love of letters to that of pleaſure, a taſte very common amongſt the Italian ladies of that age. The young philoſopher yielded to the force of theſe allurements, or rather, according to the account of his nephew, and biographer, Franciſco of Mirandola, eagerly followed the bent of his diſpoſition, naturally inclined to obey the attractions of beauty.

But this life of pleaſure, however ſuitable to his condition and inclinations, was of a ſhort continuance. Irritated by the reſtleſs perſecutions of his enemies, and obliged perpetually to defend himſelf againſt the imputation of hereſy, the moſt formidable calumny which in that age any man could have to contend with, he detached himſelf from vicious pleaſures, and regulated his manner of life by rigidly obſerving the laws of abſtinence impoſed by Chriſtianity; for being a firm adherent to the Chriſtian doctrines, the charge of infidelity and the vigilance of his enemies made him the more ſolicitous to guard againſt the appearance of diſobeying them. Becoming from this time wholly devoted to learning, he ſoon acquired ſuch celebrity that the moſt eminent ſcholars from all parts of Italy came to viſit him for converſation or inſtruction. As a proof of the ſincerity of his reformation, he committed to the flames five books of elegiac poetry which he had compoſed on the ſubject of his amours, together with numerous pieces in Tuſcan verſe, which had been addreſſed to his various miſtreſſes. There is perhaps reaſon to lament that the zeal of a new convert would not be ſatisfied without this ſacrifice. It muſt, however, be conſidered that the ſpirit of religion at that period exacted many ſacrifices from the profeſſors of Chriſtianity, which the lenient temper of theſe times does not call for. An example of this ſeverity is to be met with amongſt the works that ſtill remain of Mirandola; at the end of which, in the folio edition publiſhed by his nephew, we find a learned and entertaining comment, in the Italian language, upon a compoſition of his friend Girolamo Benivieni, entitled *Una Canzona de Amore ſecundo la mente et openione de' Platonici*, "A poetical treatiſe upon love, explaining the doctrines of the Platoniſts." The author, Girolamo, informs the reader, in a ſhort preface, that he had determined to ſuppreſs this poem and comment out of regard to his friend's character and his own; deeming it unbecoming a profeſſor of Chriſtianity, in treating of celeſtial and divine love, "to treat of it as a Platoniſt and not as a Chriſtian;" but that having lent it to ſome of his friends for their peruſal, an imperfect and erroneous copy was printed, which obliged him, but not till after the death of Mirandola, to publiſh it correctly; and he takes care to allege, in excuſe for himſelf, that he has apprized the reader of his plan by the title of the poem, and warned him in all places where Plato's opinions depart from thoſe of Chriſt, that the doctrines of a gentile and a heathen are not entitled to the leaſt weight compared with the reaſonings of the Chriſtian theologiſts, "and particularly the irrefragable arguments of the angelic doctor St Thomas of Aquino."

The firſt fruit of Mirandola's devotion to ſacred literature was the Heptaplus, or Comment upon the Six Days of the firſt Chapter of Geneſis, which was written in 1491. Two years afterwards he publiſhed a treatiſe in ten chapters, *de Ente et Uno*; the object of which was to reconcile the doctrines of Plato and Ariſtotle, and to demonſtrate that the diſputes of their reſpective followers originated in a miſconception of the opinions of theſe philoſophers relative to the *Ens* and *Unum*, at that time a ſubject of mighty ſtrife among the learned. This treatiſe was held in high eſteem by both ſides. It was the laſt work of conſequence that the author lived to complete; but he had laid the plan of a vaſt and comprehenſive work, which his early death prevented the execution of. This was no leſs than to confound the ſeven enemies of the Chriſtian church, by examining and refuting all their errors. In the proſecution of this deſign, he had compoſed and perfected before his death twelve books againſt aſtrology, the moſt popular and the moſt pernicious ſuperſtition which then infeſted the world. Paulus Jovius, biſhop of Nocera, has left a teſtimony to the merits of this work, which is above all other encomiums:—"In this excellent though unfiniſhed work, Mirandola attacked the aſtrologers with ſuch erudition and keenneſs, and ſo ably expoſed the abſurdity and vanity of the whole art of divination, that he ſeems to have deterred the profeſſors of the occult ſciences from writing *."

This great deſign, as well as many others which Mirandola had formed, particularly that of a more complete eſſay towards reconciling the opinions of Plato and Ariſtotle, was fruſtrated by his death. From the time that he left Rome, which was ſoon after the publication of the Apologia, Mirandola generally reſided either at Ferrara or at Florence. The friendſhip of the prince of Ferrara and its vicinity to his paternal ſeat attracted him to the former place; but Florence was the moſt agreeable to him, on account of the ſociety of literary men which it afforded, and particularly of *Politian* and *Lorenzo de Medici*, with whom he entertained a cloſe friendſhip. Beſides theſe two illuſtrious men, his ſociety was cultivated by other eminent ſcholars, among whom was the learned and unfortunate Hieronymus Savanarola, and Hermolaus Barbarus; Petrus Crinitus, the pupil of Politian †, mentions him as excelling all his companions in the erudition and eloquence of his converſation. The ſame author has left us an account of Pica's laborious ſtudies; for when Politian had expreſſed in his preſence high admiration of his great genius and learning, Mirandola with ſingular modeſty anſwered, that he deſerved no praiſe but for his aſſiduous application—"Gratulandum potius, intelligite, aſſiduis vigiliis atque lucubrationibus, quam noſtro ingenio plaudendum ‡."

His library likewiſe is celebrated by the ſame writer, and is ſaid by Franciſco de Mirandola to have coſt 7000 pieces of gold. His accompliſhments were not confined to ſubjects of abſtruſe literature; in his youth he was much attached to muſic, in which he acquired ſuch ſkill, that

* *Paul. Jov. Elog. Doct. Vir.* p. 92.

† *P. Crinitus de honeſta Diſcip.* lib. iii. c. 2. lib. v. c. 1. & lib. ii. c. 2.

‡ *Ib.* lib. ii. c. 2.

Pica. that fome of his melodies were publicly received, and held in great efteem. It might alfo be concluded, from an anecdote related by Petrus Crinitus, that he was not unacquainted with phyfic; for according to that author, when Hermolaus Barbarus was feized at Rome with a dangerous fever, Mirandola fent him from Florence a medicine prepared by himfelf. No man ever teftified a more fincere devotion for learning and philofophy, to the contempt of all other qualifications, than the Prince of Mirandola. He poffeffed a very large eftate, which he beftowed almoft entirely upon works of charity, except what was fpent in collecting books, and entertaining and providing for literary men. At length, however, about three years before his death, he made over to his nephew Francifco his principality and poffeffions in Mirandola, and obtained a confirmation of the grant from Maximilian, the Roman emperor, to whom that principality was fubject. He referved to himfelf only enough to purchafe a fmall eftate near Ferrara, where he fpent the remainder of his life, except when he refided at Florence, in elegant and learned retirement. His mother, under whofe care he received his education, had deftined him for the church; and he was often urged by his friends to embrace the facred profeffion, with the certainty of the higheft honours and emoluments: but nothing could induce him to quit the life that he had chofen. He died of a fever at Florence, in the year 1494, in the 31ft year of his age, on the fame day that Charles IX. of France entered that city on his famous expedition into Italy. That monarch, hearing of Mirandola's illnefs, as he approached the city, fent two of his own phyficians to his affiftance; but in fpite of their aid, the violence of his diforder put an end to his exiftence in 13 days.

With refpect to the works of this author, fomething has already been faid, and little more remains to be obferved. The *Conclufiones* afford a very complete fpecimen of the learning of the age, and of what were deemed the moft valuable purpofes to which learning could be applied. However ufelefs and unprofitable thefe purpofes may appear to us, it will not be denied by any one, who has the curiofity to look through the *Conclufiones*, that the mafs of learning, which muft have been poffeffed by the propofer of them, is prodigious; when it is recollected that, at the time he propofed them, he was no more than 23 years of age. For there is not the leaft reafon to fuppofe, that a perfon whofe works prove him to have been a man of profound learning, and who, in an age and nation diftinguifhed by fome of the brighteft fcholars that ever appeared, was ranked by their own judgment amongft the firft, fhould have challenged the difcuffion of any of the propofed fubjects, without being well provided with the knowledge neceffary for fuch a debate. The manner in which the queftions were propounded leave little room to doubt that the author was deeply verfed in the refpective fubjects of them; and the Apology for the accufed propofitions, particularly thofe *de Salute Origenis* and *de Magiâ atque Cabalâ*, difcover familiarity with the writings of the Fathers, as well as with the Greek and Hebrew claffics, and a facility of language and argument that could not be acquired at that age without extraordinary powers of mind. It would be worth while to tranfcribe the whole of this curious piece for the amufement of fuch of our readers as may not have accefs to the original, but our limits do not admit of it. Pica.

It is curious to obferve how greatly the fudden growth of learning outftripped that of folid fcience. No age, perhaps, was ever fo remarkable for the learning which it produced as the period from the middle of the 15th century to the beginning of the 16th; yet, except the ineftimable obligations we owe to the learned men of that time for their editions of the claffics, later ages have been little benefited by their works, which are either loft or neglected, and even the fciences they treated of exploded and ridiculed. School-divinity and metaphyfics, though the moft attended to, were not the only ftudies in which the vaft erudition of that age was wafted. The myfterious doctrines of the Cabala formed a favourite ftudy of fome of the moft learned fcholars. The propofition which laid Pica open to the indignation of the church, was that in which he afferted the orthodoxy of Origen; for Origen, notwithftanding his meritorious labours in the caufe of Chriftianity, his daring zeal and felf-martyrdom, and notwithftanding the defence of Eufebius, was configned by the fentence of the church to inevitable damnation, on account of his errors in the myfteries of the faith. To queftion his perdition, therefore, was to deny that the church was the interpreter of the divine intentions. The defence of this part of the *Conclufiones* is written with a boldnefs that could hardly be expected from an Italian of the 15th century. But the hardieft of thefe propofitions was that in which it is afferted, that faith is not in a man's own power. In defending this and the other propofitions, which were taxed with herefy, Pica probably relied lefs on the fpirit and ability of his juftification, than on his own high rank and ftation, together with the countenance and protection of his powerful friends, particularly the Medici, whofe liberality of fentiment in regard to religious points was fo notorious, that even Leo. X. has been directly charged, not only with herefy, but infidelity *.

By the Cabala, a term at this time generally mifapprehended, was underftood fometimes a fpecies of divine magic operating by the agency of good fpirits, as magic commonly fo called was fuppofed to do by that of evil beings; but the true definition of it, as received by the beft of its profeffors, is given by Reuchlinus (A), in his treatife addreffed to Lorenzo de Medici, *Divinæ Revelationis ad falutiferam Dei et formarum feparatarum contemplationem traditæ fymbolica receptio*,—a fymbolic acceptation of the Mofaic hiftory (for that is meant by *divina revelatio*) which produced a pure and perfect acquaintance with the nature of the divinity and of fpirits; and according to the opinions of fome, which feem to be revived by the modern Swedenborgians, this knowledge, when fublimed to the higheft perfection it was capable of, and accompanied with perfect purity, was believed to

* *Milner's Hift. of the Church*, vol. iv.

(A) This treatife, which contains the whole learning upon a fubject once held in the higheft veneration by men of learning, is very curious, and is to be found in the folio edition of Mirandola's works, publifhed at Bafil in 1557.

Pica.

to raise the mind to an absolute familiarity with good angels, by whose assistance the possessors of the cabalic secrets were enabled to do miraculous things. This art was derived from the rabbinical doctors, who were at first called Thalmudists; and, about the middle of the 15th century, according to Pica de Mirandola *, its professors were denominated Cabalici, Cabalæi, or Cabalistæ, according to their different degrees of perfection: they afterwards, however, departed from their masters the Thalmudists; the latter, according to Reuchlinus, being chiefly intent upon the law and the explanation of it, while the former, paying less regard to what concerned human affairs, aimed chiefly at elevation of mind and thought. The ideas and doctrines of the Cabalists seem to have been well known to Milton, and perhaps suggested some passages in Paradise Lost. In Reuchlinus's Exposition of their mysteries there is a curious passage describing the speech of the Deity to the heavenly spirits after the fall of Adam, with the future prospect of redemption by the incarnation of the Messiah, whom the Cabalists recognised in the character of a celestial Adam (B); and, among the books relating to these doctrines, which are said to be lost, mention is made of *Liber Bellorum Domini*. The mysteries of the Pythagorean philosophy, which, according to Philolaus apud Reuchlinum, sprung from the same source, were also studied and taught with great fervency during this period. Mirandola and Paulus Riccius were the first who explained the Cabalistic mysteries in Latin, and the former, in his Apology, has employed much labour and learning in defending them, as well as the science of natural magic, from the vulgar idea that necromancy was at the bottom of them. His writings, however, upon that subject were few, and we do not know whether they still exist; but it may be collected from the following proposition in his *Conclusiones*, and some others of a similar nature, that he, like all the scholars of his time, had bestowed much attention upon this useless learning: "Qui scierit quid sit denarius in Arithmetica formali, et cognoverit natura primi numeri sphærici, sciet secretum quinquaginta portarum intelligentiæ et magni jobelæi, et millesimæ generationis, et regnum omnium seculorum." Those who are well acquainted with the tenets of the modern millenarians will be able to tell whether there be any connection between them and the allusions in the concluding part of this proposition.

* Reuchlinus de Arte Cabalist.

Magic also entered deeply into the learning of this era. This comprises two distinct sciences, that of natural magic, and that of dæmonology: the first was concerned only in the properties of numbers and figures, and some of the more hidden properties of nature. This knowledge enabled its possessors to produce many effects from natural causes, which, when science was less diffused than at present, appeared to be the effect of something superior to the common limits of human power. Albertus, commonly called Magnus, the friend and tutor of Roger Bacon, was the most celebrated of those who excelled in this sort of knowledge. This science has been productive of many admirable discoveries in mathematics and chemistry. Magic, in its common signification, or necromancy, was also eagerly studied at this time, as appears from Cornelius Agrippa's strange work upon that subject; and we may judge of the estimation in which it was held, by the confession that writer makes in his book *De vanitate omnium Scientiarum*, that while he professed that science, he derived more credit and profit from it, than from any other use he ever could make of his learning. The first master in this way was said to be * Solomon, whose magic ring and glass are still famous in eastern dæmonology.

Pica.

* P. Crinitus de honesta Disciplina lib. ix. c. 5.

But the most dangerous, the most popular, and the most pernicious delusion which the darkness of the preceding ages had entailed upon mankind, was astrology, which will perhaps never be utterly exterminated from the minds of the vulgar, but which then possessed all ranks. When these considerations are taken into the account, it must be looked upon as no despicable application of learning and talents, to have exposed the fallacy and absurdity of this delusion; and when we recollect the great learning and credit of some of its upholders, among whom our countryman Roger Bacon was the most esteemed; the almost universal belief entertained of it, and the few lights which mankind then possessed, as to the real and constant laws obeyed by the celestial bodies; it cannot be denied that the twelve books written by Mirandola against astrology, the effect of which, in opening men's eyes upon that subject is testified by a respectable cotemporary author, were the work of a very superior and enlightened mind. When we congratulate ourselves upon our freedom from these superstitions, we ought not to forget, that we owe something to those who gave the first blow to them. Proud of the lights of the age we live in, when astrology and such like cheats are no longer in vogue, we are too apt to overlook the merit of those exertions which first exposed and refuted them; and to persuade ourselves, that in these days of genius and philosophy, such exertions would have been unnecessary; not recollecting that if we enjoy many superiorities of this kind, we are less indebted for them to our own genius than to the labours of those who first paved the way for the detection of superstitious errors; our merit is, that we do not shut our eyes to the light of science; but while we enjoy its blaze, we ought to be grateful to those who struck the first sparks.

John Pica of Mirandola has been represented by writers, whose ideas are taken from the encomiums of his cotemporaries, as a mighty prodigy of learning and genius. The distaste which the present times entertain towards those subjects upon which he wrote, renders it very difficult, upon a review of his works, to think those encomiums justified. But making allowance for this change of opinion, and weighing the impartial testimony of his equals, and the early age at which he obtained their admiration, it may be fairly concluded, he was in reality, a man of very extraordinary powers. These memoirs are principally collected from his letters, and the account given of him by his nephew Francisco, himself

(c) Conjicimus sane, alterum esse Adam cœlestem angelis in cœlo demonstratum, unum ex Deo, quem verbo fecerat, et alterum esse Adam terrenum, repulsum à Deo, quem ex luto manibus suis finxerat. *Reuchlinus*, p. 750.

Pica, Picard. felf an eminent fcholar. Such a biographer might naturally be fufpected of partiality; but the evidence of other writers fully confirms his account. Paulus Jovius, in his *Elogia Doctorum Virorum*, gives the following character of him *. "John Pica of Mirandola, has been juftly ftyled the phœnix; for in him, the immortal gods, befides the fplendour of his family, affembled all the rareft gifts of body and mind."

* P. 92.

Petrus Riccius, commonly called Petrus Crinitus, who was the pupil of Politian and the companion of Mirandola, laments the death of him and Politian, which happened in the fame year, as a public misfortune, more feverely felt at that particular time, when learning, obftructed by the incurfion of the French into Italy, wanted the fupport and affiftance of fuch men ‡. To thefe may be added the teftimony of Hieronymus Savanarola, who, though afterwards put to death by Pope Alexander for a heretic, was a man of great confideration on account of his learning and talents. In a difpute which took place between him and Mirandola, concerning the philofophy of the ancients; the former, yielding to the fuperiority of his opponent, rofe up and embracing him faid, "Unus tu es, Pice, ætate noftra qui omnium veterum philofophiam ac religionis Chriftianæ præcepta et leges percalleas ||. The following epitaph, written by Hercules Strozza, is preferved by Paulus Jovius:

‡ *Pet. Criu. de honefta Difcip.*

|| *Ib.* iii. c. 2.

Joannes jacet hic Mirandola; cætera norunt
Et Tagus et Ganges, forfan et Antipodes.

Dr Johnfon in his Effay on Epitaphs, has taken notice of this pompous diftich, as a warning to epitaph writers. "Thus, fays he, have their expectations been difappointed, who honoured Picus of Mirandola with this pompous epitaph. His name, then celebrated in the remoteft corners of the earth, is now almoft forgotten; and his works, then ftudied, admired, and applauded, are now mouldering in obfcurity." *Monthly Mag.*

PICARD, a native of the Netherlands, who founded a fect the profeffors of which were called *Picards*. See PICARDS.

PICARD, *John*, an able mathematician, and one of the moft learned aftronomers of the 17th century, was born at Fleche, and became prieft and prior of Rillie in Anjou. Going to Paris, he was in 1666 received into the Academy of Sciences in quality of aftronomer. In 1671, he was fent by order of the king, to the caftle of Uraniburg, built by Tycho Brahe in Denmark, to make aftronomical obfervations there; and from thence he brought the original manufcripts wrote by Tycho Brahe, which are the more valuable as they differ in many places from the printed copies, and contain a book more than has yet appeared. He made important difcoveries in aftronomy; and was the firft who travelled through feveral parts of France, to meafure a degree of the meridian. His works are, 1. A treatife on levelling. 2. Fragments of dioptrics. 3. *Experimenta circa aquas effluentes.* 4. *De menfuris.* 5. *De menfura liquidorum & aridorum.* 6. A voyage to Uraniburg, or aftronomical obfervations made in Denmark. 7. Aftronomical obfervations made in feveral parts of France, &c. Thefe, and fome other of his works, which are much efteemed, are in the fixth and feven volumes of the Memoirs of the Academy of Sciences.

PICARDS, a religious fect which arofe in Bohemia in the 15th century. Picards.

Picard, the author of this fect, from whom it derived its name, drew after him, as has been generally faid, a number of men and women, pretending he would reftore them to the primitive ftate of innocence wherein man was created: and accordingly he affumed the title of the *New Adam*. With this pretence he taught his followers to give themfelves up to all impurity; faying that therein confifted the liberty of the fons of God; and that all thofe not of their fect were in bondage. He firft publifhed his notions in Germany and the Low Countries, and perfuaded many people to go naked, and gave them the name of *Adamites*. After this he feized on an ifland in the river Laufnecz, fome leagues from Thabor, the head quarters of Zifca, where he fixed himfelf and his followers. His women were common, but none were allowed to enjoy them without his permiffion: fo that when any man defired a particular woman, he carried her to Picard, who gave him leave in thefe words, *Go, increafe, multiply, and fill the earth.*

At length, however, Zifca, general of the Huffites, (famous for his victories over the emperor Sigifmund), hurt at their abominations, marched againft them, made himfelf mafter of their ifland, and put them all to death except two; whom he fpared, that he might learn their doctrine.

Such is the account which various writers, relying on the authorities of Æneas Sylvius and Varillas, have given of the Picards, who appear to have been a party of the Vaudois, that fled from perfecution in their own country, and fought refuge in Bohemia. It is indeed doubtful whether a fect of this denomination, chargeable with fuch wild principles and fuch licentious conduct, ever exifted; and it is certainly aftonifhing that Mr Bayle, in his art. *Picards*, fhould adopt the reproachful reprefentations of the writers juft mentioned: for it appears probable at leaft that the whole is a calumny invented and propagated in order to difgrace the Picards, merely becaufe they deferted the communion and protefted againft the errors of the church of Rome. Lafitius informs us, that Picard, together with 40 other perfons, befides women and children, fettled in Bohemia in the year 1418. Balbinus the Jefuit, in his *Epitome Rerum Bohemicarum*, lib. ii. gives a fimilar account, and charges on the Picards none of the extravagancies or crimes afcribed to them by Sylvius. Schlecta, fecretary of Ladiflaus, king of Bohemia, in his letters to Erafmus in which he gives a particular account of the Picards, fays that they confidered the pope, cardinals, and bifhops of Rome, as the true Antichrifts, and the adorers of the confecrated elements in the eucharift as downright idolaters; that they denied the corporal prefence of Chrift in this ordinance; that they condemned the worfhip of faints, prayers for the dead, auricular confeffion, the penance impofed by priefts, the feafts and vigils obferved in the Romifh church; and that they confined themfelves to the obfervance of the fabbath, and of the two great feafts of Chriftmas and Pentecoft. From this account it would appear that they were no other than the Vaudois; and M. de Beaufobre has fhown that they were both of the fame fect, though under different denominations. Befides, it is certain that the Vaudois were

Picard || Piccolomini.

were settled in Bohemia in the year 1178, where some of them adopted the rites of the Greek, and others those of the Latin church. The former were pretty generally adhered to till the middle of the 14th century, when the establishment of the Latin rites caused great disturbance. On the commencement of the national troubles in Bohemia, on account of the opposition to the papal power (see MORAVIANS), the Picards more publicly avowed and defended their religious opinions; and they formed a considerable body in an island by the river Launitz or Lausnecz, in the district of Bechin, and recurring to arms, were defeated by Zisca. *Encyclop.* art. Picards.

PICARDY, a province in France, is bounded on the north by Hainault, Artois, and the straits of Calais; on the east by Champagne; on the south by the Isle of France; and on the west by Normandy and the English channel (A). This province is long and narrow, being usually compared to a bent arm; and in this figure is nearly 150 miles in length, but not above 40 in breadth, and in many places not above 20. It is generally a level country; and produces wine, fruit of all kinds, plenty of corn, and great quantities of hay: but wood being scarce, most of the inhabitants burn turf. They have, however, some pit-coal, but it is not so good as that of England. It was united to the crown of France in the year 1643; and is supposed to contain 533,000 inhabitants.

Its principal rivers are the Somme, the Oise, the Canche, the Lanthie, the Lys, the Aa, the Scarpe, and the Deule.

The situation of this province on the sea, its many navigable rivers and canals, with the industry of the inhabitants, render it the seat of a flourishing trade. In it are many beautiful silk stuffs, woollen stuffs, coarse linen, lawn, and soap; it also carries on a large trade in corn and pit-coal. In the districts of Calais and Boulogne are annually bred 5000 or 6000 colts, which being afterwards turned loose in the pastures of Normandy, are sold for Norman horses. The fisheries on this coast are also very advantageous. This province was formerly divided into Upper, Middle, and Lower Picardy, and again subdivided into four deputy governments. The principal town is Amiens.

PICCOLOMINI, ALEXANDER, archbishop of Patras, and a native of Sienna, where he was born about the year 1508, was of an illustrious and ancient family, which came originally from Rome, but afterwards settled at Sienna. He composed with success for the theatre; but he was not more distinguished by his genius, than by the purity of his manners, and his regard to virtue. His charity was very great; and was chiefly exerted in relieving the necessities of men of letters. He has left behind him a number of works in Italian; the most remarkable of which are, 1. Various Dramatic pieces, which laid the first foundation of his character as a writer. 2. A Treatise on the Sphere. 3. A Theory of the Planets. 4. A Translation of Aristotle's Art of Rhetoric and Poetry, in 4to. 5. A System of Morality published at Venice, 1575, in 4to; translated into French by Peter de Larivey in 4to; and printed at Paris, 1581. These, with a variety of other works, prove his extensive knowledge in natural philosophy, mathematics, and theology. He was the first who made use of the Italian language in writing upon philosophical subjects. He died at Sienna the 12th of March 1578, aged 70. A particular catalogue of his works may be seen in the Typographical Dictionary. There is one performance ascribed to this author, entitled *Dialogo della bella Creanta delle Donne,* (printed at Milan, 1558, and at Venice, 1574, in 8vo.); which but ill suits the dignity of a prelate. It is filled with maxims which have an evident tendency to hurt the morals of young women. Piccolomini's name, indeed, is not in the title page; and it has all the appearance of being a juvenile production. It is very scarce; and the public would sustain no loss by its being entirely out of print. It was translated into French by F. d'Amboise, and published at Lyons, in 16mo, under the title of *Instruction des jeunes dames.* It was afterwards reprinted in 1583, under that of *Dialogue et Devis des Demoiselles.*

Piccolomini.

PICCOLOMINI, *Francis*, of the same family with the foregoing, was born in 1520, and taught philosophy with success for the space of 22 years, in the most celebrated universities of Italy, and afterwards retired to Sienna, where he died, in 1604, at the age of 84. This city went into mourning on his death. His works are, 1. Some Commentaries upon Aristotle, printed at Mayence, 1608, in 4to. 2. *Universa Philosophia de Moribus*, printed at Venice, 1583, in folio. He laboured to revive the doctrine of Plato, and endeavoured also to imitate the manners of that philosopher. He had for his rival the famous James Zabarella, whom he excelled in facility of expression and neatness of discourse; but to whom he was much inferior in point of argument, because he did not examine matters to the bottom as the other did, but passed too rapidly from one proposition to another.

PICCOLOMINI of *Arragon*, *Octavius*, duke of Amalfi, prince of the empire, a general of the emperor's army, and knight of the order of the Golden Fleece, was born in 1599. He first bore arms among the Spanish troops in Italy. He afterwards served in the army of Ferdinand II. who sent him to the relief of Bohemia, and entrusted him with the command of the imperial troops in 1634. After having signalized himself at the battle of Nortlingue, he made Marshal de Chatillon raise the siege of St Omer. He had the good fortune to gain a victory over Marquis de Feuquieres in 1639: nor did the loss of the battle of Wolfenbuttle, in 1651, impair his glory. He died on the 10th of August 1656, being five years after, aged 57, without issue; and with the character of an able negotiator and an active general. The celebrated Caprara was his nephew.

(A) The origin of the name of this province does not date earlier than A. D. 1200. It was an academical joke; an epithet first applied to the quarrelsome humour of those students in the university of Paris who came from the frontier of France and Flanders, and hence to their country. *Valesii Notitia Galliarum*, p. 447. *Longuerue, Description de la France*, p. 52.

Piccolomini ‖ Pickering.

PICCOLOMINI, *James*, whose proper name was *Ammanati*, took that of *Piccolomini* in honour of his patron Pius II. He was born in a village near Lucca in 1422. He became bishop of Massa, afterwards of Frescati; a cardinal in 1461, under the name of *Cardinal de Pavie*; and died in 1479, at the age of 57, of an indigestion of figs. He left 8000 pistoles in the bankers hands, which Pope Sixtus IV. claimed; and of which he gave a part to the Hospital of the Holy Ghost. His works, which consist of some Letters, and a history of his own time, were printed at Milan, in 1521, in folio. His history, entitled *Commentaries*, commences the 18th of June 1464, and ends the 6th of December 1469. They may very properly be considered as a Sequel of Pope Pius II.'s Commentaries, which end with the year 1463.

PICCOLOMINI, ÆNEAS SYLVIUS. See PIUS II.

PICENTIA, (Strabo, Pliny), the capital of the Picentini, whose territory, called *Ager Picentinus*, a small district, lay on the Tuscan sea, from the *Promontorium Minervæ*, the south boundary of Campania on the coast, to the river Silarus, the north boundary of Lucania, extending within-land as far as the Samnites and Hirpini, though the exact termination cannot be assigned. The Greeks commonly confound the *Picentini* and *Picentes*, but the Romans carefully distinguish them. The former, with no more than two towns that can be named, *Silernum* and *Picentia*; the situation of both doubtful: only Pliny says the latter stood within-land, at some distance from the sea. Now thought to be *Bicenza*, (Holstenius), in the Principato Citra of Naples.

PICENUM, (Cæsar, Pliny, Florus); PICENUS AGER, (Cicero, Sallust, Livy, Tacitus); *Ager Picentium*, (Varro): a territory of Italy, lying to the east of Umbria, from the Apennine to the Adriatic; on the coast extending from the river Aesis on the north, as far as the *Prætutiani* to the south. In the upper or northern part of their territory the Umbri excluded them from the Apennine, as far as Camerinum, (Strabo); but in the lower or southern part they extended from the Adriatic to the Apennine. A very fruitful territory, and very populous. *Picentes*, the people, (Cicero); from the singular *Picens*, (Livy): different from the *Picentini* on the Tuscan sea, though called so by the Greeks; but Ptolemy calls them *Piceni*, as does also Pliny. Their territory at this day is supposed to form the greatest part of the March of Ancona, (Cluverius).

PICHFORD, in the county of Salop in England; on the south-east side of Shrewsbury, near Condover. It is noted for a spring of pitchy water (from whence some derive its name), on the top of which there always flows a sort of liquid bitumen. Over most of the coal pits in this neighbourhood there lies a stratum of blackish rock; of which, by boiling and grinding, they make pitch and tar, and also distil an oil from it.

PICHINCHA, or PINCHINCA, a mountain in Peru. See PERU, N° 56.

PICKERING, in the north riding of Yorkshire in England, 13 miles from Scarborough, and 125 from London, is a pretty large town belonging to the duchy of Lancaster, on a hill among the wild mountains of Blakemore; having the forest of Pickering on the north, and Pickering-common on the south. It is said to have been built 270 years before Christ by Peridurus, a king of the Britons, who was buried here. It had once a castle, the ruins of which are still to be seen; to whose jurisdiction many of the neighbouring villages were subject: and the adjacent territory, commonly called Pickering-Lath, or the liberty or forest of Pickering, was given by Henry III. to his son Edmund earl of Lancaster. A court is kept here for all actions under 40s. arising within the honour of Pickering.

Pickering ‖ Pico.

PICKERY, in *Scots Law*, petty theft, or stealing things of small value.

PICKETS, in fortification, stakes sharp at one end, and sometimes shod with iron, used in laying out the ground, of about three feet long; but, when used for pinning the fascines of a battery, they are from three to five feet long.

PICKETS, in artillery, are about five or six feet long, shod with iron, to pin the park lines, in laying out the boundaries of the park.

PICKETS, in the camp, are also stakes of about six or eight inches long, to fasten the tent cords, in pitching the tents; also of about four or five feet long, driven into the ground near the tents of the horsemen, to tie their horses to.

PICKET, an out-guard posted before an army, to give notice of an enemy approaching.

PICKET, a kind of punishment so called, where a soldier stands with one foot upon a sharp-pointed stake; the time of his standing is limited according to the offence.

PICKLE, a brine or liquor, commonly composed of salt, vinegar, &c. sometimes with the addition of spices, wherein meat, fruit, and other things, are preserved and seasoned.

PICO, one of the Azores islands, is so called from some lofty mountains on it; or rather from one very high mountain, terminating like Teneriffe in a peak, and reputed by some writers equal to it in height. This island lies about four leagues south-west from St George, twelve from Tercera, and about three leagues south-east of Fayal; in W. Long. 28. 21. and N. Lat. 38. 29. The mountain Pico, which gives name to the island, is filled with dismal dark caverns or volcanoes, which frequently vomit out flames, smoke, and ashes, to a great distance. At the foot of this mountain towards the east is a spring of fresh water, generally cold, but sometimes so heated with the subterraneous fire, as to rush forth in torrents with a kind of ebullition like boiling water; equalling that in heat, and sending forth a steam of sulphureous fetid vapours, liquefied stones, minerals, and flakes of earth, all on fire, in such quantities, and with such a violence, as to have formed a kind of promontory vulgarly called *Mysterios*, on the declivity of the coast, and at the distance of 1200 paces from the fountain. Such at least is the account of Ortelius; though we do not find this last circumstance of the promontory confirmed by later observations. The circumference of Pico is computed at about 15 leagues: and its most remarkable places are Pico, Lagoas, Santa Cruce or Cruz, San Sebastian, Pesquin, San Roko, Playa, and Magdalena; the inhabitants of which live wholly on the produce of the island, in great plenty and felicity. The cattle are various, numerous, and excellent in their several kinds: it is the same with the vine; and its juice, prepared into different wines, the best in the Azores.

Besides cedar and other timber, they have a kind of wood which they call *teixo*, solid and hard as iron; and veined, when finely polished, like a rich scarlet tabby; which colour it has in great perfection. The longer it is kept, the more beautiful it grows: hence it is, that the teixo tree is felled only for the king's use or by his order; and is prohibited from being exported as a common article of trade.

Pico *Marina*, a sea fish common at Kongo in Africa, derives its name from the resemblance of its mouth to the beak of a woodpecker. It is of a large size, and prodigious strength, has four fins on its back, three under its belly, and one on each side of its head; its tail is large and forked, by which it cuts the waves with surprising force and velocity. It is at war with every fish that swims, and with every thing it meets in its way, without being intimidated by the largest vessels; a surprising instance of which intrepidity, we are told by some missionaries, whose ship was attacked by one of them, near these coasts, in the dead of night. The violence of the shock which it gave to the vessel quickly awakened the captain and the rest of the people; who immediately ran to the ship's side, where they perceived, by moon light, this huge monster fastened by its forehead to the vessel, and making the strongest efforts to disengage itself; upon which some of them tried to pierce him with their pikes, but he got off before they could accomplish their aim. On the next morning, upon visiting that side of the vessel, they found a piece of the bony snout stuck fast into the wood, and two or three inches of it projecting outwards. In the inside of the ship, there was discovered about five or six inches more of the point of the horn, which had penetrated through the plank. But we must observe, that the credulity of the times probably rendered this animal thus formidable.

Mod. Univ. History, vol. xiii. p. 46. &c

PICQUERING, a flying war, or skirmish, made by soldiers detached from two armies for pillage, or before a main battle begins.

PICQUET, or Picket. See Piquet.

PICRAMNIA, a genus of plants belonging to the diœcia class; and in the natural method ranking with those that are doubtful. See Botany *Index*.

PICRANIA amara, or *Bitter Wood*, is a tall and beautiful timber tree, common in the woods of Jamaica, belonging to the pentandria class of plants. The name is expressive of its sensible qualities.

Every part of this tree is intensely bitter; and even after the tree has been laid for floors many years, whoever rubs or scrapes the wood, feels a great degree of bitterness in their mouth or throat. Cabinet-work made of this wood is very useful, as no insect will live near it.

This tree has a great affinity to the *Quassia Amara* of Linnæus; in lieu of which it is used as an antiseptic in putrid fevers. When used, less of it will do than of the *Quassia Amara* of Surinam. See Quassia, Botany and Materia Medica *Index*.

PICRIS, Ox-tongue; a genus of plants, belonging to the syngenesia class. See Botany *Index*.

PICRIUM, a genus of plants, belonging to the tetrandria class; and in the natural method ranking with those that are doubtful. See Botany *Index*.

PICTET, Benedict, a celebrated divine, was born at Geneva, in 1655, of a distinguished family, and prosecuted his studies with great success. After having travelled into Holland and England, he taught theology in his own country with an extraordinary reputation. The university of Lyden, after the death of Spantreina, solicited him to come and fill his place; but he thought that his own country had the best right to his services; and for that generosity he received its thanks by the mouth of the members of council. A languishing disorder, occasioned by too much fatigue, hastened his death: which happened on the 9th of June 1724, at the age of 69 years. This minister had much sweetness and affability in his manner. The poor found in him a comforter and a father. He published a great number of works in Latin and French, which are much esteemed in Protestant countries. The principal of these are, 1. A System of Christian Theology in Latin, 3 vols. in 4to; the best edition of which is that of 1721. 2. Christian Morality, printed at Geneva, 1710, 8 vols. in 12mo. 3. The History of the 11th and 12th centuries; intended as a sequel to that of Sueur, printed in 1713, 2 vols. in 4to. The Continuator is held in higher estimation than the first author. 4. Several Controversial Treatises. 5. A great number of tracts on morality and piety; among which we must distinguish "the Art of Living and Dying well;" published at Geneva, 1705, in 12mo. 6. Some Letters. 7. Some Sermons, from 1697 to 1721; 4 vols. in 8vo. With a vast number of other books, the names of which it would be tedious to mention; but which, as Mr Sennebier says, "all show evident marks of piety and good sense."

Pictet, *John-Louis*, a counsellor of Geneva, born in 1739, was of the same family. He was member of the Council of Two Hundred; counsellor of State and Syndic; and died in 1781. He applied himself to the study of astronomy, and made several voyages into France and England for his improvement. Few men were ever blessed with a clearer or more enlightened understanding. He has left in manuscript the "Journal of a Voyage which he made to Russia and Siberia in 1768 and 1769, in order to observe the transit of Venus over the sun's disk:" A work very interesting, from the lively descriptions which it gives both of men and of nature.

PICTLAND. See Pentland.

PICTS, the name of one of those nations who anciently possessed the north of Britain. It is generally believed that they were so called from their custom of painting their bodies; an opinion which Camden supports with great erudition. (See Gough's edition, Vol. I. p. xci. of the preface). It is certainly liable, however, to considerable objections; for as this custom prevailed among the other ancient inhabitants of Britain, who used the *glastum* of Pliny and the *vitrum* of Mela for the like purpose, it may be asked, Why the name of *Picti* was confined by the Romans to only one tribe, when it was equally applicable to many others? Why should they design them only by an epithet, without ever annexing their proper name? Or why should they impose a new name on this people only, when they give their proper name to every other tribe which they have occasion to speak of? As these questions cannot be answered in any satisfactory manner, it is plain we must look for some other derivation of the name. I Name.

The Highlanders of Scotland, who speak the ancient language of Caledonia, express the name of this once famous

mous nation by the term *Pictich;* a name familiar to the ears of the most illiterate, who could never have derived it from the Roman authors. The word *Pictich* means *pilferers* or *plunderers.* The appellation was probably imposed upon this people by their neighbours, or assumed by themselves, some time after the reign of Caracalla, when the unguarded state of the Roman province, on which this people bordered, gave them frequent opportunities of making incursions thither, and committing depredations. Accordingly this name seems to have been unknown till the end of the 3d century. Eumenius the panegyrist is the first Roman author who mentions this people under their new name of *Pictich,* or, with a Latin termination, *Picti.* When we say that this name may have been probably assumed for the reason just now mentioned, we must observe, that, in those days of violence, the character of a robber was attended with no disgrace. If he had the address to form his schemes well, and to execute them successfully, he was rather praised than blamed for his conduct; providing he made no encroachments on the property of his own tribe or any of its allies. We mean this as no peculiar stigma upon the Picts; for other nations of antiquity, in the like rude state, thought and acted as they did. See *Thucydides,* lib. iii. p. 3. and *Virg. Æn.* vii. 745 et 749.

2 Origin. Concerning the origin of the Picts, authors are much divided. Boethius derives them from the Agathyrsi, Pomponius Lætus from the Germans, Bede from the Scythians, Camden (A) and Father Innes from the ancient Britons, Stillingfleet from a people inhabiting the Cimbrica Chersonesus, and Keating and O'Flaherty, on the authority of the Cashel Psalter, derive them from the Thracians. But the most probable opinion is, that they were the descendants of the old Caledonians. Several reasons are urged in support of this opinion by Dr Macpherson; and the words of Eumenes, "Caledonum, aliorumque Pictorum, silvas," &c. plainly imply that the Picts and Caledonians were one and the same people.

As there has been much dispute about the origin of the Picts, so there has been likewise about their language. There are many reasons which make it plain that their tongue was the Gaelic or Celtic; and these reasons are a further confirmation of their having been of Caledonian extract. Through the east and north-east coasts of Scotland (which were possessed by the Picts) we meet with an innumerable list of names of places, rivers, mountains, &c. which are manifestly Gaelic. From a very

3 Language. old register of the priory of St Andrew's (Dalrymple's Collections, p. 122.) it appears, that in the days of Hungus, the last Pictish king of that name, St Andrew's was called *Mukross;* and that the town now called *Queensferry* had the name of *Ardchinneachan.* Both these words are plain Gaelic. The first signifies "the heath or promontory of boars;" and the latter, "the height or peninsula of Kenneth." In the list of Pictish kings published by Father Innes, most of the names are obviously Gaelic, and in many instances the same with the names in the list of Scottish or Caledonian kings published by the same author. Had Innes understood any thing of this language, he would not have supposed with Camden that the Picts spoke the British tongue. It was unlucky that the two words on which they built their conjecture (*Strath* and *Aber*) are as common in the Gaelic as they could have been in the British, and at this day make a part of the names of places in countries to which the Pictish empire never extended. The names of *Strathfillan* and *Lochaber* may serve as instances.

The venerable Bede, as much a stranger to the Celtic as either of the antiquaries just now mentioned, is equally unhappy in the specimen which he gives of the Pictish language in the word *penuahel,* "the head of the wall." Allowing the commutation of the initial *p* into *c,* as in some other cases, this word has still the same meaning in Gaelic which Bede gives it in the Pictish. It is true, there might have been then, as well as now, a considerable difference between various dialects of the Celtic; and thus, perhaps, that pious author was led to discover five languages in Britain *agreeably to the five books of Moses:* A conceit from which the good man derived a great deal of harmless satisfaction.

The Picts of the earliest ages, as appears from the joint testimony of all writers who have examined the subject, possessed only the east and north-east coast of Scotland. On one side, the ancient Drumalbin, or that ridge of mountains reaching from Lochlomond near Dumbarton to the frith of Tain, which separates the county of Sutherland from a part of Ross, was the boundary of the Pictish dominions. Accordingly we find in the life of Columba, that, in travelling to the palace of Brudius, king of the Picts, he travelled over Drumalbin, the *Dorsum Britanniæ* of Adamnan. On the other side, the territory of the Picts was bounded by the Roman province. After Britain was relinquished by the emperor Honorius, they and the Saxons by turns were masters of those countries which lie between the frith of Edinburgh and the river Tweed. We learn from Bede, that the Saxons were masters of Galloway when he finished his Ecclesiastical History. The Picts, however, made a conquest of that country soon after; so that, before the extinction of their monarchy, all the territories bounded on the one side by the Forth and Clyde, and on the other by the Tweed and Solway, fell into their hands. 4 Territory.

The history of the Picts, as well as of all the other ancient inhabitants of Britain, is involved in obscurity. The Irish historians give us a long list of Pictish kings, who reigned over Pictavia for the space of 11 or 13 centuries before the Christian era. After them Innes, in his Critical Essay, gives us a list of above fifty, of whom no less than five held the sceptre, each for a whole century. It is probable that these writers had confounded the history of the Picts with that of their ancestors the old Caledonians. In any other view, their accounts of them are highly fabulous; and have been long ago confuted by Dr Macpherson of Slate, an antiquary of much learning and research. The Picts, as has been already 5 History.

(A) See *Gough's edition of Camden,* Vol. I. Preface, p. xc. and the *Ancient Universal History,* Vol. XVII. p. 39, &c.

Picts. already observed, were probably not known by that name before the 2d or 3d century. Adamnan, abbot of Iona, is the first author that expressly mentions any Pictish king; and the oldest after him is Bede. We are informed by these two writers, that St Columba converted Brudius king of the Picts to the Christian faith. Columba came into Britain in the year of the vulgar era 565. Before that period we have no general record to ascertain so much as the name of any Pictish king. The history of *Drust* or *Drest*, who is said to have reigned over the Picts in the beginning of the fifth century, when St Ninian first preached the gospel to that nation, has all the appearance of fiction (B). His having reigned a hundred years, and his putting an end to a hundred wars, are stories which exceed all the bounds of probability.

Brudius, the contemporary of Columba, is the first Pictish king mentioned by any writer of authority.

What figure his ancestors made, or who were his successors on the throne of Pictavia, cannot be ascertained. Bede informs us, that, during the reign of one of them, the Picts killed Egfred king of Northumberland in battle, and destroyed the greatest part of his army. The same author mentions another of their kings called *Naitan*, for whom he had a particular regard. It was to this *Naitan* that Ceolfrid, abbot of Wiremouth, wrote his famous letter concerning Easter and the Tonsure (C); a letter in which Bede himself is supposed to have had a principal hand. Roger Hoveden and Simon of Durham mention two other Pictish kings *Onnust* and *Kinoth*, the first of whom died in 761, and the latter flourished about the 774, and gave an asylum to Alfred of Northumberland, who was much about that time expelled his kingdom. The accounts given by the Scots historians of several other Pictish kings cannot be depended on; nor are the stories told by the British historians, Geoffroy of Monmouth and the author of the *Eulogium Britanniæ*, worthy of much greater credit.

In the ninth century the Pictish nation was totally subdued by the Scots in the reign of Kenneth Macalpin. Since that time their name has been lost in that of the conquerors, with whom they were incorporated after this conquest; however, they seem to have been treated by the Scottish kings with great lenity, so that for some ages after they commanded a great deal of respect. The prior of Hogulstead, an old English historian, relates, that they made a considerable figure in the army of David the Saint, in his disputes with Stephen king of England. In a battle fought in the year 1136, by the English on one side, and the Scots and Picts on the other, the latter insisted on their hereditary right of leading the van of the Scots army, and were indulged in that request by the king.

The principal seat of the Pictish kings was at Abernethy. Brudius, however, as appears from the accounts given by Adamnan, in his life of Columba, had a palace at Inverness, which was probably near the extremity of his territory in that quarter; for there is no good reason for believing, with Camden, that this king had any property in the Western Isles, or that he had made a gift of Iona to St Columba when he visited him in that place. Picts ‖ Picturesque Beauty.

6 Manners. With respect to the manners and customs of the Picts, there is no reason to suppose they were any other than those of the old Caledonians and Scots, of which many particulars are related in the Greek and Roman writers who have occasion to speak of those nations.

Upon the decline of the Roman empire, cohorts of barbarians were raised, and Picts were invited into the service, by Honorius, when peace was every where restored, and were named *Honoriaci*. Those under Constantine opened the passes of the Pyrenean mountains, and let the barbarous nations into Spain. From this period we date the civilization of their manners, which happened after they had by themselves, and then with the Scots, ravaged this Roman province.

PICTS Wall, in antiquity, a wall begun by the emperor Adrian, on the northern bounds of England, to prevent the incursions of the Picts and Scots. It was first made only of turf strengthened with palisadoes, till the emperor Severus, coming into Britain in person, built it with solid stone. This wall, part of which still remains, began at the entrance of the Solway frith in Cumberland, and running north-east extended to the German ocean. See ADRIAN and SEVERUS.

PICTURE, a piece of painting, or a subject represented in colours, on wood, canvas, paper, or the like. See PAINTING.

PICTURESQUE BEAUTY, says a late writer on that subject, refers to "such beautiful objects as are suited to the pencil." This epithet is chiefly applied to the works of nature, though it will often apply to works of art also. Those objects are most properly denominated picturesque, which are disposed by the hand of nature with a mixture of *varied rudeness*, *simplicity*, and *grandeur*. A plain neat garden, with little variation in its plan, and no striking grandeur in its position, displays too much of art, design, and uniformity, to be called picturesque. "The ideas of *neat* and *smooth* (says Mr Gilpin), instead of being picturesque, in fact disqualify the object in which they reside from any pretensions to picturesque beauty. Nay, farther, we do not scruple to assert, that roughness forms the most essential point of difference between the beautiful and the picturesque; as it seems to be that particular quality which makes

(B) According to Camden, this conversion happened about the year 630, in the southern Pictish provinces; while the northern, which were separated by fruitful mountains, were converted by Columba.

(C) We are told by some authors that Columba taught the Picts to celebrate Easter always on a Sunday between the 14th and 20th of March, and to observe a different method of tonsure from the Romans, leaving an imperfect appearance of a crown. This occasioned much dispute till Naitan brought his subjects at length to the Roman rule. In that age many of the Picts went on a pilgrimage to Rome, according to the custom of the times; and amongst the rest we find two persons mentioned in the antiquities of St Peter's church. *Asterius* count of the Picts, and *Syra* with his countrymen, performed their vow.

Picturefque Beauty.

makes objects chiefly pleafing in painting. I ufe the general term *roughnefs*; but properly fpeaking roughnefs relates only to the furfaces of bodies: when we fpeak of their delineation, we ufe the word *ruggednefs*. Both ideas, however, equally enter into the picturefque, and both are obfervable in the fmaller as well as in the larger parts of nature; in the outline and bark of a tree, as in the rude fummit and craggy fides of a mountain.

Let us then examine our theory by an appeal to experience, and try how far thefe qualities enter into the idea of picturefque beauty, and how far they mark that difference among objects which is the ground of our inquiry.

"A piece of Palladian architecture may be elegant in the laft degree; the proportion of its parts, the propriety of its ornaments, and the fymmetry of the whole, may be highly pleafing; but if we introduce it in a picture, it immediately becomes a formal object, and ceafes to pleafe. Should we wifh to give it picturefque beauty, we muft ufe the mallet inftead of the chiffel; we muft beat down one half of it, deface the other, and throw the mutilated members around in heaps; in fhort, from a fmooth building we muft turn it into a rough ruin. No painter who had the choice of the two objects would hefitate a moment.

"Again, why does an elegant piece of garden-ground make no figure on canvas? the fhape is pleafing, the combination of the objects harmonious, and the winding of the walk in the very line of beauty. All this is true; but the fmoothnefs of the whole, though right and as it fhould be in nature, offends in picture. Turn the lawn into a piece of broken ground, plant rugged oaks inftead of flowering fhrubs, break the edges of the walk, give it the rudenefs of a road, mark it with wheel tracks, and fcatter around a few ftones and brufhwood; in a word, inftead of making the whole fmooth, make it rough, and you make it alfo picturefque. All the other ingredients of beauty it already poffeffed." On the whole, picturefque compofition confifts in uniting in one whole, a variety of parts, and thefe parts can only be obtained from rough objects.

It is poffible, therefore, to find picturefque objects among works of art, and it is poffible to make objects fo; but the grand fcene of picturefque beauty is nature in all its original variety, and in all its irregular grandeur. "We feek it (fays our author) among all the ingredients of landfcape, trees, rocks, broken grounds, woods, rivers, lakes, plains, valleys, mountains, and diftances. Thefe objects in themfelves produce infinite variety; no two rocks or trees are exactly the fame; they are varied a fecond time by combination; and almoft as much a third time by different lights and fhades and other aerial effects. Sometimes we find among them the exhibition of a whole, but oftener we find only beautiful parts."

Sublimity or grandeur alone cannot make an object picturefque: for, as our author remarks, "however grand the mountain or the rock may be, it has no claim to this epithet, unlefs its form, its colour, or its accompaniments, have fome degree of beauty. Nothing can be more fublime than the ocean; but wholly unaccompanied, it has little of the picturefque. When we talk therefore of a fublime object, we always underftand that it is alfo beautiful; and we call it fublime or beautiful only as the ideas of fublimity or fimple beauty prevail. But it is not only the form and the compofition of the objects of landfcape which the picturefque eye examines; it connects them with the atmofphere, and feeks for all thofe various effects which are produced from that vaft and wonderful ftorehoufe of nature. Nor is there in travelling a greater pleafure than when a fcene of grandeur burfts unexpectedly upon the eye, accompanied with fome accidental circumftance of the atmofphere which harmonizes with it, and gives it double value."

Picturefque Beauty.

There are few places fo barren as to afford no picturefque fcene.

> ———————Believe the mufe,
> She does not know that inaufpicious fpot
> Where beauty is thus niggard of her ftore.
> Believe the mufe, through this terreftrial wafte
> The feeds of grace are fown, profufely fown,
> Even where we leaft may hope.——

Mr Gilpin mentions the great military road between Newcaftle and Carlifle as the moft barren tract of country in England; and yet there, he fays, there is "always fomething to amufe the eye. The interchangeable patches of heath and green-fward make an agreeable variety. Often too on thefe vaft tracts of interfecting grounds we fee beautiful lights, foftening off along the fides of hills; and often we fee them adorned with cattle, flocks of fheep, heath-cocks, grous, plover, and flights of other wild fowl. A group of cattle ftanding in the fhade on the edge of a dark hill, and relieved by a lighter diftance beyond them, will often make a complete picture without any other accompaniment. In many other fituations alfo we find them wonderfully pleafing, and capable of making pictures amidft all the deficiencies of landfcape. Even a winding road itfelf is an object of beauty; while the richnefs of the heath on each fide, with the little hillocks and crumbling earth, give many an excellent leffon for a foreground. When we have no opportunity of examining the grand fcenery of nature, we have everywhere at leaft the means of obferving with what a multiplicity of parts, and yet with what general fimplicity, fhe covers every furface.

"But if we let the imagination loofe, even fcenes like thefe adminifter great amufement. The imagination can plant hills; can form rivers and lakes in valleys; can build caftles and abbeys; and, if it find no other amufement, can dilate itfelf in vaft ideas of fpace."

Mr Gilpin, after defcribing fuch objects as may be called picturefque, proceeds to confider their fources of amufement. We cannot follow our ingenious author through the whole of this confideration, and fhall therefore finifh our article with a fhort quotation from the beginning of it. "We might begin (fays he) in moral ftyle, and confider the objects of nature in a higher light than merely as amufement. We might obferve, that a fearch after beauty fhould naturally lead the mind to the great origin of all beauty; to the

> ——— firft good, firft perfect, and firft fair.

But though in theory this feems a natural climax, we infift the lefs upon it, as in fact we have fcarce ground to hope that every admirer of picturefque beauty is an admirer

admirer alfo of the beauty of virtue; and that every lover of nature reflects, that

Nature is but a name for an *effect*,
Whofe *caufe* is God.————

If, however, the admirer of nature can turn his amufements to a higher purpofe; if its great fcenes can infpire him with religious awe, or its tranquil fcenes with that complacency of mind which is fo nearly allied to benevolence, it is certainly the better. *Apponat lucro.* It is fo much into the bargain; for we dare not promife him more from picturefque travel than a rational and agreeable amufement. Yet even this may be of fome ufe in an age teeming with licentious pleafure; and may in this light at leaft be confidered as having a moral tendency.

PICUIPINIMA, is the Brafilian name of a fpecies of pigeon, which is fo very fmall as fcarcely to exceed the lark in fize.

PICUMNUS and PILUMNUS, were two Roman deities, who prefided over the aufpices required before the celebration of nuptials. Pilumnus was fuppofed to patronize children, as his name feems in fome manner to indicate *quod pellat mala infantiæ*. The manuring of land was firft invented by Picumnus, from which reafon he is called *Sterquilinius*. Pilumnus is alfo invoked as the god of bakers and millers, as he is faid to have firft invented the art of grinding corn.

PICUS, the WOODPECKER, a genus of birds belonging to the order of picæ. See ORNITHOLOGY *Index*.

PICUS, in fabulous hiftory, a king of Latium, fon of Saturn. He married Venilia, alfo called Canens, by whom he had Faunus. He was tenderly loved by the goddefs Pomona, and he returned her affection. As he was one day hunting in the woods, he was met by Circe, who became deeply enamoured of him, and who changed him into a woodpecker, called by the name of *picus* among the Latins. His wife Venilia was fo difconfolate when fhe was informed of his death, that fhe pined away. Some fuppofe that Picus was the fon of Pilumnus, and that he gave out prophecies to his fubjects by means of a favourite woodpecker; from which circumftance originated the fable of his being metamorphofed into a bird.

PICUS, *John Francis*, prince of Mirandola, nephew of John Pica or Picus, mentioned above, was born about the year 1469. He cultivated learning and the fciences after the example of his uncle; but he had a principality and dominions to fuperintend, which involved him in great troubles, and at laft coft him his life. He was twice driven from his principality, and twice reftored; and at laft, in 1533, was, together with his eldeft fon Albert, affaffinated in his own caftle by his nephew Galeoti. He was a great lover of letters; and fuch of his works as were then compofed were inferted in the Strafburg edition of his uncle's in 1504, and continued in future impreffions, befides fome others which were never collected.

PIECE, in matters of money, fignifies fometimes the fame thing with fpecies; and fometimes, by adding the value of the pieces, it is ufed to exprefs fuch as have no other particular name. For the piece of eight, or piaftre, fee *MONEY Table*.

PIECE, is alfo a kind of money of account, or rather manner of accounting, ufed among the negroes on the coaft of Angola in Africa. See *MONEY Table*.

PIECE, in *Heraldry*, denotes an ordinary or charge. The honourable pieces of the fhield are the chief, fefs, bend, pale, bar, crofs, faltier, chevron, and in general all thofe which may take up one third of the field, when alone, and in what manner foever it be. See HERALDRY.

PIECES, in the military art, include all forts of great guns and mortars. Battering pieces are the larger fort of guns ufed at fieges for making the breaches; fuch are the 24-pounder and culverine, the one carrying a 24 and the other an 18 pound ball. Field-pieces are 12-pounds, demiculverines, 6-pounders, fackers, minions, and 3-pounders, which march with the army, and encamp always behind the fecond line, but in day of battle are in the front. A foldier's firelock is likewife called his *piece*.

PIEDMONT, a country of Italy, having formerly the title of a principality, is bounded on the north by Savoy and Italy; on the weft by France; on the fouth by the Mediterranean and the republic of Genoa; and on the eaft by the duchies of Montferrat and Milan; extending about 150 miles from north to fouth, but much lefs from eaft to weft. It is called Piedmont, and in Latin *Piedmontium*, from its fituation at the foot of the mountains, or Alps, which feparate France from Italy. This country is in fome parts mountainous, but is everywhere very fruitful. The plains produce fine corn, and Montferrat and the Milanefe yield great quantities of Turkey wheat, which commonly ferves for bread, and with which the people of the middle rank mix rye; the pods are ufed for fuel, and the ftalks being thick ferve to mend the roads. The hills produce plenty of wine, which, like the Italian wines, is very lufcious when new, efpecially the white. There is alfo a tartifh red wine called *vino brufco*, faid to be very wholefome for fat people, and, on the other hand, the fweet wine is recommended as a ftomachic. The neighbourhood of Turin is famous for its fine fruits, and many long walks of chefnut and mulberry trees, which produce both pleafure and profit. Marons, or large chefnuts, are a favourite dainty among the common people. Thefe are put into an oven, and, when thoroughly hot, and cooled in red wine, are dried a fecond time in the oven, and afterwards eaten cold. Truffles grow here in fuch abundance, that Piedmont has obtained the name of the *truffle country*. Some are black, others white marbled with red. Their price is rated according to their fize. Sometimes they are found of 12 or 14 pounds weight; and many country people earn from 60 to 70 dollars a-year merely by digging for them. The trade in cattle is faid to bring into Piedmont no lefs than three millions of livres per annum. The cultivation of filk is alfo a profitable article, the Piedmontefe filk being, on account of its finenefs and ftrength, efteemed the beft in Italy. The Piedmontefe gentry breed vaft numbers of filk-worms under the care of their tenants, who have the eggs and mulberry leaves delivered to them, and in return they give half the filk to their mafters. This principality comprehends eleven fmall provinces: Piedmont proper, the valleys between France and Italy, the valley of Saluza, the county of Nice, the marquifate of Sufa, the duchy of Auft, the Canavefe, the lordfhip of Vetfail,

Piedmont. fail, the county of Aſt, and the Langes. It was formerly a part of Lombardy, but now belongs to the king of Sardinia, and lies at the foot of the Alps, which ſeparate France from Italy. It contains many high mountains, among which there are rich and fruitful valleys, as pleaſant and populous as any part of Italy. In the mountains are mines of ſeveral kinds, and the foreſts afford a great deal of curious game, among which the *tumor* is an uſeful animal. "The mules (ſays Mr Watkins) are very fine in this country; but the inhabitants have other beaſts, or rather monſters, which they find very ſerviceable, though vicious and obſtinate. Theſe are produced by a cow and an aſs, or mare and bull, and called *jumarres* or *gimerri* (A). I cannot ſay that I have ever ſeen any of them, but I am told they are very common."

The Piedmonteſe are ſaid to be more intelligent than the Savoyards, but leſs ſincere. Some authors repreſent them as lively, artful, and witty, the inhabitants of the mountain of Aoſta excepted, who are farther diſtinguiſhed by large wens, as even their horſes, dogs, and other animals. Mr Baretti, however, in his *Account of Italy*, vol. ii. p. 116. gives the following account of them. "One of the chief qualities (ſays he), which diſtinguiſh the Piedmonteſe from all other Italians, is their want of cheerfulneſs. Piedmont never produced a ſingle good poet, as far as the records of the country can go, whereas there is no other province of Italy but what can boaſt of ſome poet ancient or modern; and yet the Piedmonteſe are not deficient in ſeveral branches of learning, and ſome of them have ſucceeded tolerably well in civil law, phyſic, and the mathematics. It is likewiſe obſerved of this people, that none of them ever attained to any degree of excellence in the polite arts, and it is but lately that they can boaſt of a painter, Cavaliero Bomente; a ſtatuary, Signor Lodetto; and ſome architects, Conte Alfieri, Signor Borra, and others, who yet, to ſay the truth, are far inferior to numberleſs artiſts produced by the other provinces of Italy. They have, on the other hand, greatly advanced when conſidered as ſoldiers; though their troops have never been very numerous, every body converſant in hiſtory knows the brave ſtand they made for ſome centuries paſt againſt the French, Spaniards, and Germans, whenever they have been invaded by theſe nations. The ſkill of the Piedmonteſe in fortification is likewiſe very great, and their Bertolas and Pintos have ſhown as much genius as the Vaubans and Cohorns, in rendering impregnable ſeveral places which inferior engineers would only have made ſecure."

Payne's Geog. vol. ii. The chief trade of this principality conſiſts in hemp and ſilk. Indeed, ſo great is their trade in raw ſilk, that the Engliſh alone have purchaſed to the value of 200,000 lib. in a year. The ſilk worm thrives ſo well, that many peaſants make above (B) 100 lib. of ſilk annually; and it is not only abundant, but univerſally known to be ſtronger and finer than any in Italy. The land owners divide the profit with their tenants. The Piedmonteſe workmen, however, are ſaid to want expertneſs, though they finiſh their work equally well with thoſe of other nations. The high duty and land-carriage on mules likewiſe tend to leſſen the value of this trade. They have beſides corn, rice, wine, fruits, flax, and cattle.

Piedmont, Pienes.

In the valleys of Lucerne, Peyrouſe, and St Martin, which have always belonged to Piedmont, live the celebrated Waldenſes or Vaudois, a name which ſignifies *people of the valleys*. Theſe have rendered themſelves famous in hiſtory for their diſſent from the Romiſh church long before the time of Luther and Calvin, and for the perſecutions they have ſuffered on that account; but ſince the year 1730 they have not been openly moleſted for their religion, but, in order to ſuppreſs them by degrees, a popiſh church has been built in every pariſh. They are heavily taxed, and labour under great oppreſſions. The number of people in theſe valleys ſcarce at preſent exceeds 10,000, of which 1000 are Catholics. The chief river of Piedmont is the Po, which flows out of Mount Viſo. The river Seſia, the Doria, Baltea, the ancient Druria, the Tenaro, and ſeveral others, run into it. The Var, anciently called the Varus, riſes in the county of Nice, and after watering it empties itſelf into the Mediterranean. The language of the Piedmonteſe is a mixture of French and Italian. In this country are about 50 earldoms, 15 marquiſates, a multitude of lordſhips, and 20 abbeys. Though the country be entirely popiſh, except ſome valleys inhabited by the Waldenſes, the king reſerves to himſelf the greateſt part of the power in church affairs, which in many other places is given up to the pope, and the conſtitution *unigenitus* is here univerſally oppoſed. Towards the end of the 17th century, the French king perſuaded the duke of Savoy to drive them out of the country; in conſequence of which 200,000 of them retired to Germany, England, and Holland, and yet they are not all extirpated, though, as we have obſerved, they are obliged to have a Roman Catholic church in every pariſh.

Turin, formerly the reſidence of the king of Sardinia, to whom this principality belonged, is the chief city. See TURIN. The number of inhabitants, Mr Watkins ſays, in Piedmont and Savoy, amount to 2,695,727 ſouls, of which Turin contains about 77,000. Piedmont, as well as the reſt of Italy, few of our readers need be informed, is now ſubject to the overgrown power of France.

PIENES, a ſmall iſland of Japan, oppoſite to the harbour of Saccai, is famed not only for the beauty of its walks, to which crowds of people reſort from the city, but for a deity worſhipped there, to which vaſt numbers of perſons devote themſelves. They go from his temple to the ſea ſide, where they enter into a boat provided

(A) Theſe equivocal animals, however, if we may ſo term them, are ſo generally mentioned by travellers in this part of Europe, that we have no doubt of their exiſtence, or of their being found hardy and ſerviceable as labourers.

(B) Each pound is valued in Piedmont at 18s. The little village of La Tour, in the valley of Lucerne, makes above 50,000 lb. annually, and the exports every year to the ſingle city of Lyons amount to more than 160,000l. ſterling.

provided for the purpose; then, launching into the deep, they throw themselves overboard, loaded with stones, and sink to the bottom. The temple of that deity, which is called Canon, is very large and lofty, and so are many others in the city itself; one in particular, dedicated to the gods of other countries, is thought the finest in the whole empire.

PIEPOUDRE, Court of, the lowest, and at the same time the most expeditious, court of justice known to the law of England. It is called PIEPOUDRE, (*curia pedis pulverizati*), from the dusty feet of the suitors; or, according to Sir Edward Coke, because justice is there done as speedily as dust can fall from the foot: Upon the same principle that justice among the Jews was administered in the gate of the city, that the proceedings might be the more speedy, as well as public. But the etymology given us by a learned modern writer is much more ingenious and satisfactory; it being derived, according to him, from *pied puldreaux*, "a pedlar," in old French, and therefore signifying the court of such petty chapmen as resort to fairs or markets. It is a court of record incident to every fair and market; of which the steward of him who owns or has the toll of the market is the judge. It was instituted to administer justice for all commercial injuries done in that very fair or market, and not in any preceding one. So that the injury must be done, complained of, heard, and determined, within the compass of one and the same day, unless the fair continues longer. The court hath cognizance of all matters of contract that can possibly arise within the precinct of that fair or market; and the plaintiff must make oath that the cause of an action arose there. From this court a writ of error lies, in the nature of an appeal, to the courts at Westminster. The reason of its institution seems to have been, to do justice expeditiously among the variety of persons that resort from distant places to a fair or market; since it is probable, that no other inferior court might be able to serve its process, or execute its judgments, on both or perhaps either of the parties; and therefore, unless this court had been erected, the complaint must necessarily have resorted even in the first instance to some superior judicature.

PIER, in building, denotes a mass of stone, &c. opposed by way of fortress to the force of the sea, or a great river, for the security of ships that lie at harbour in any haven.

PIERS of a Bridge. See BRIDGE.

PIERCEA. See RIVINIA.

PIERIA, in *Ancient Geography*, a district of Macedonia, contained between the mouths of the rivers Ludias and Peneus; extended by Strabo beyond the Ludias, to the river Axios on the north, and on the south no farther than the Aliacmon, along the west side of the Sinus Thermaicus.—Another *Pieria* of Syria, the north part of Seleucia, or the *Antiochena*, situated on the Sinus Issicus, and lying next Cilicia to the north-west.

PIERIDES, in fabulous history, the daughters of Pierus a Macedonian prince, presuming to dispute with the muses for the prize of poetry, were turned into magpies. The name of *Pierides* was also given to the muses, from Mount Pieris in Thessaly, which was consecrated to them; or, according to others, from Pieris, a Thessalian poet, who was the first who sacrificed to them. See PIERIS.

PIERINO DEL VAGA, an eminent Italian painter, born of poor parents in Tuscany, about the year 1500. He was placed apprentice with a grocer in Florence, and got some instructions from the painters to whom he was sent with colours and pencils; but a painter named *Vaga* taking him to Rome, he was called *Del Vaga*, from living with him, his real name being *Buonacorsi*. He studied anatomy with the sciences necessary for his profession; and had somewhat of every thing that was good in his compositions. After Raphael's death, he joined with Julio Romano and Francisco Penni to finish the works in the Vatican which were left imperfect by their common master; and to confirm their friendship married Penni's sister. He gained the highest reputation by his performances in the palace of Prince Doria at Genoa: but the multiplicity of his business, and the vivacity of his imagination, drained his spirits in the flower of his age; for he died in the year 1547. Of all Raphael's disciples, Pierino kept the character of his master longest, i. e. his exterior character and manner of designing; for he fell very short of the fineness of Raphael's thinking. He had a particular genius for the decoration of places according to their customs. His invention in that kind of painting was fully of ingenuity; grace and order are everywhere to be met with, and his dispositions, which are ordinary in his pictures, are wonderful in his ornaments: some of these he has made little, and some great, and placed them both with so much art, that they set off one another by comparison and contrast. His figures are disposed and designed according to Raphael's gusto; and if Raphael gave him at first some slight sketches of ornaments, as he did to Giovanni d'Udine, he executed them to admiration. The tapestries of the seven planets, in seven pieces, which Pierino designed for Diana de Poitiers, and which were, when De Piles wrote, with Monsieur the first president at Paris, show sufficiently what he was, and that the above character does not exceed the truth.

PIERIS, in *Ancient Geography*, a mountain which is thought to have given name to Pieria of Macedonia; taking its name from Pierus a poet, who was the first that sacrificed to the Muses, thence called *Pierides*, if credit may be given to an ancient scholiast on Juvenal.

PIERRE D'AUTOMNE is a French name, translated from the Chinese, of a medicinal stone, celebrated in the east for curing all disorders of the lungs. Many imagine it had its name of the autumn-stone from its being only to be made at that season of the year; but it may certainly be made equally at all times. The Chinese chemists refer the various parts of the body to the several seasons of the year, and thus they refer the lungs to autumn. This is evident in their writings, and thus the stone for diseases of the lungs came to be called *autumn-stone*. It is prepared as follows: They put 30 pints of the urine of a strong and healthy young man into a large iron pot, and set it over a gentle fire. When it begins to boil, they add to it, drop by drop, about a large tea-cup-full of rape oil. They then leave it on the fire till the whole is evaporated to a thick substance like black mud. It is then taken out of the pot,

and

and laid on a flat iron to dry, so that it may be powdered very fine. This powder is moistened with fresh oil, and the mass is put into a double crucible, surrounded with coals, where it stands till it be thoroughly dried again. This is again powdered, and put into a china vessel, which being covered with silk cloth and a double paper, they pour on it boiling water, which makes its way, drop by drop, through these coverings, till so much is got in as is sufficient to reduce it to a paste. This paste is well mixed together in the vessel it is kept in, and this is put into a vessel of water, and the whole set over the fire. The matter thus becomes again dried in *balneo mariæ*, and is then finished. *Observ. sur les Cout. de l'Asie*, p. 258.

Pierre, *St*, is a large river in North America, scarcely inferior to the Rhine or the Danube, and navigable almost to its source. Together with many other large streams, it falls into the great river Mississippi.

Pierre, *St*, or *St Peter's*, the capital of Martinico, was built in 1665, in order to overawe the mutineers of the island who rebelled against its proprietors, the second West India Company, who were at the same time the proprietors of all the French Antilles. It is situated on the western side of the island. The town extends along the shore, and a battery that commands the road is erected on the west side, which is washed by the river Royolan, or St Peter. The town is divided into three wards; the middle, which is properly St Peter's, begins at the fort, and runs westward to the battery of St Nicholas. Under the walls of the second ward ships at anchor ride more securely than under the fort, on which account this ward is called the *Anchorage*. The third ward, called the *Gallery*, extends along the sea side from Fort St Peter to the Jesuits River, and is the most populous part of the city. The houses of St Peter's ward are neat, commodious, and elegant, particularly those of the governor of the island, the intendant, and the other officers. The parish church of St Peter is a magnificent stone building which belonged to the Jesuits, with a noble front of the Doric order. The church of the Anchorage, which belongs to the Jacobine friars, is likewise of stone. It is a place of considerable trade, and is built with tolerable regularity. The houses are mostly constructed of a gray pumice-stone or lava, which is found on the strand; and the high-street is, according to Dr Isert, above an English mile in length. It is supposed to contain about 2000 houses, and 30,000 inhabitants, including negroes. St Pierre, with the whole of the flourishing island of Martinicio, was taken from the French in the month of March 1794, by the British troops; 125 vessels loaded with the produce of the island, and of great value, were captured, 71 of which were in the harbour of St Pierre.

PIETISTS, a religious sect, sprung up among the Protestants of Germany, seeming to be a kind of mean between the Quakers of England and the Quietists of the Romish church. They despise all sorts of ecclesiastical polity, all school theology, and all forms and ceremonies, and give themselves up to contemplation and the mystic theology. Many gross errors are charged on the Pietists, in a book entitled *Manipulus Observationum Antipietisticarum*; but they have much of the air of polemical exaggeration, and are certainly not at all just. Indeed there are Pietists of various kinds: Some running into gross illusions, and carrying their errors to the overturning of a great part of the Christian doctrine, while others are only visionaries; and others are very honest and good, though perhaps misguided, people. They have been disgusted with the coldness and formality of other churches, and have thence become charmed with the fervent piety of the Pietists, and attached to their party, without giving into the grossest of their errors. See *Mosheim's Eccl. History*, vol. iv. p. 454.

Pietists, otherwise called the *Brethren and Sisters of the Pious and Christian Schools*, a society formed in the year 1678 by Nicholas Barre, and obliged by their engagements to devote themselves to the education of poor children of both sexes.

PIETOLA, anciently called *Andes*, is a place within two Italian miles of Mantua, famous for being the birthplace of Virgil.

PIETY, is a virtue which denotes veneration for the Deity, and love and tenderness to our friends. This distinguished virtue, like many others, received among the Romans divine honours, and was made one of their gods. Acilius Glabrio first erected a temple to this divinity, which he did upon the spot on which a woman had fed with her own milk her aged father, who had been imprisoned by order of the senate, and deprived of all aliments. The story is well known, and is given at length in authors which are in the hands of every schoolboy. See *Cicero de div.* I. and *Valerius Maximus*, v. c. 4. and our article *Filial Piety*.

If piety was thus practised and thus honoured in Heathen antiquity, it surely ought not to be less so, among Christians, to whom its nature is better defined, and to the practice of which they have motives of greater cogency. A learned and elegant writer has said that the want of piety arises from the want of sensibility; and his observations and arguments are so just and so well expressed, that we cannot do better than transcribe them.

"It appears to me (says Dr Knox), that the mind of man, when it is free from natural defects and acquired corruption, feels no less a tendency to the indulgence of devotion than to virtuous love, or to any other of the more refined and elevated affections. But debauchery and excess contribute greatly to destroy all the susceptible delicacy with which nature usually furnishes the heart; and, in the general extinction of our better qualities, it is no wonder that so pure a sentiment as that of piety should be one of the first to expire.

"It is certain that the understanding may be improved in a knowledge of the world, and in the arts of succeeding in it, while the heart, or whatever constitutes the seat of the moral and sentimental feelings, is gradually receding from its proper and original perfection. Indeed experience seems to evince, that it is hardly possible to arrive at the character of a complete man of the world, without losing many of the most valuable sentiments of uncorrupted nature. A complete man of the world is an artificial being; he has discarded many of the native and laudable tendencies of his mind, and adopted a new system of objects and propensities of his own creation. These are commonly gross, coarse, sordid, selfish, and sensual. All, or either of these attributes, tend directly to blunt the sense of every thing liberal, enlarged, disinterested; of every thing which participates more of an intellectual than of a sensual nature. When the heart is tied down to the earth by lust and avarice, it is not extraordinary that the eye should be

Piety. seldom lifted up to heaven. To the man who spends his Sunday (because he thinks the day fit for little else) in the counting-house, in travelling, in the tavern, or in the brothel, those who go to church appear as fools, and the business they go upon as nonsense. He is callous to the feelings of devotion; but he is tremblingly alive to all that gratifies his senses or promotes his interest.

"It has been remarked of those writers who have attacked Christianity, and represented all religions merely as diversified modes of superstition, that they were indeed, for the most part, men of a metaphysical and a disputatious turn of mind, but usually little distinguished for benignity and generosity. There was, amidst all their pretensions to logical sagacity, a cloudiness of ideas, and a coldness of heart, which rendered them very unfit judges on a question in which the heart is chiefly interested; in which the language of nature is more expressive and convincing, than all the dreary subtleties of the dismal metaphysicians. Even the reasoning faculty, on which we so greatly value ourselves, may be perverted by excessive refinement; and there is an abstruse, but vain and foolish philosophy, which philosophizes us out of the noblest parts of our noble nature. One of those parts of us is our instinctive sense of religion, of which not one of those brutes which the philosophers most admire, and to whose rank they wish to reduce us, is found in the slightest degree to participate.

"Such philosophers may be called, in a double sense, the enemies of mankind. They not only endeavour to entice man from his duty, but to rob him of a most exalted and natural pleasure. Such, surely, is the pleasure of devotion. For when the soul rises above this little orb, and pours its adoration at the throne of celestial majesty, the holy fervour which it feels is itself a rapturous delight. Neither is this a declamatory representation, but a truth felt and acknowledged by all the sons of men; except those who have been defective in sensibility, or who hoped to gratify the pride or the malignity of their hearts by singular and pernicious speculation.

"Indeed all disputatious, controversial, and metaphysical writings on the subject of religion, are unfavourable to genuine piety. We do not find that the most renowned polemics in the church militant were at all more attentive than others to the common offices of religion, or that they were actuated by any peculiar degree of devotion. The truth is, their religion centered in their heads, whereas its natural region is the heart. The heart! confined, alas! in colleges or libraries, unacquainted with all the tender charities of husband, father, brother, friend; some of them have almost forgotten that they possess a heart. It has long ceased to beat with the pulsations of love and sympathy, and has been engrossed by pride on conquering an adversary in the syllogistic combat, or by impotent anger on a defeat. With such habits, and so defective a system of feelings, can we expect that a doctor of the Sorbonne, or the disputing professor of divinity, should ever feel the pure flame of piety that glowed in the bosoms of Mrs Rowe, Mrs Talbot, or Mr Nelson?

"It is however certain, that a devotional taste and habit are very desirable in themselves, exclusive of their effects in meliorating the morals and disposition, and promoting present and future felicity. They add dignity, pleasure, and security to any age: but to old age they are the most becoming grace, the most substantial support, and the sweetest comfort. In order to preserve them, it will be necessary to preserve our sensibility; and nothing will contribute so much to this purpose as a life of temperance, innocence, and simplicity."

Piety ‖ Piganiol.

Of piety, as it denotes love and tenderness to our friends, there have been many distinguished instances both in ancient and modern times. See *FILIAL Piety*, *FRATERNAL* and *PARENTAL Affection*, &c.

The following example of filial piety in China, taken from P. Du Halde's description of that country, will not we trust be disagreeable to our readers. "In the commencement of the dynasty of the Tang, Lou-tao-tsong, who was disaffected to the government, being accused of a fault, which touched his life, obtained leave from those who had him in custody, to perform the duties of the Tao to one of his deceased friends. He managed matters so well, that giving his keepers the slip, he fled to the house of Lou Nan-kin, with whom he had a friendship, and there hid himself. Lou Nan-kin, notwithstanding the strict search that was made, and the severity of the court against those who conceal prisoners that have escaped, would not betray his friend. However, the thing coming to be discovered, Lou Nan-kin was imprisoned; and they were just on the point of proceeding against him, when his younger brother presenting himself before the judge, *It is I, Sir*, said he, *who have hidden the prisoner; it is I who ought to die, and not my elder brother.* The eldest maintained on the contrary, that his younger brother accused himself wrongfully, and was not at all culpable. The judge, who was a person of great sagacity, sifted both parties so effectually, that he not only discovered that the younger brother was innocent, but even made him confess it himself: *It is true, Sir*, said the younger all in tears, *I have accused myself falsely; but I have very strong reasons for so doing. My mother has been dead for some time, and her corpse is not yet buried; I have a sister also who is marriageable, but is not yet disposed of: these things which my brother is capable of managing, I am not, and therefore desire to die in his stead. Vouchsafe to admit my testimony.* The commissioner gave an account of the whole affair to the court, and the emperor at his solicitation pardoned the criminal."

PIG, see SUS, }
Guinea-PIG, see MUS, } MAMMALIA *Index*.

PIG of lead, the eighth part of a fother, amounting to 250 pounds weight.

PIGANIOL DE LA FORCE, JOHN AYMAR DE, a native of Auvergne, of a noble family, applied himself with ardour to the study of geography and of the history of France. With the view of improving himself in this study, he travelled into different provinces; and, in the course of his travels, made some important observations on the natural history, the commerce, the civil and ecclesiastical government of each province. These observations were of great use to him in compiling the works he has left behind him, of which the chief are, 1. An Historical and Geographical Description of France; the largest edition of which is that of 1753, in 15 vols. 12mo. It is the best work which has hitherto appeared upon that subject, though it contains a great number of inaccuracies and even errors. 2. A Description of Paris, in 10 vols. 12mo; a work equally entertaining and instructive, and much more complete than the description given by Germain Brice: besides, it is written with an elegant simplicity. He published an abridgement of it in 2 vols. 12mo.

Piganiol, Pigeon.

12mo. 3. A Defcription of the Caftle and Park of Verfailles, Marly, &c. in 2 vols. 12mo: it is very amufing, and pretty well executed. Piganiol had alfo a concern with Abbé Nadal in the journal of Trevoux. He died at Paris in February 1753, at the age of 80 years. This learned man was as much to be refpected for his manners as for his talents. To a profound and varied knowledge he united great probity and honour, and all the politenefs of a courtier.

PIGEON, fee COLUMBA, ORNITHOLOGY *Index*.

PIGEON-Houfe is a houfe erected full of holes within, for the keeping, breeding, &c. of pigeons, otherwife called a *dove-cot*.

Any lord of manor may build a pigeon-houfe on his land, but a tenant cannot do it without the lord's licence. When perfons fhoot at or kill pigeons within a certain diftance of the pigeon-houfe, they are liable to pay a forfeiture.

In order to erect a pigeon-houfe to advantage, it will be neceffary, in the firft place, to pitch upon a convenient fituation; of which none is more proper than the middle of a fpacious court-yard, becaufe pigeons are naturally of a timorous difpofition, and the leaft noife they hear frightens them. With regard to the fize of the pigeon-houfe, it muft depend entirely upon the number of birds intended to be kept; but it is better to have it too large than too little; and as to its form, the round fhould be preferred to the fquare ones; becaufe rats cannot fo eafily come at them in the former as in the latter. It is alfo much more commodious; becaufe you may, by means of a ladder turning upon an axis, eafily vifit all the nefts in the houfe, without the leaft difficulty; which cannot fo eafily be done in a fquare houfe. In order to hinder rats from climbing up the outfide of the pigeon-houfe, the wall fhould be covered with tin plates to a certain height, about a foot and a half will be fufficient; but they fhould project out three or four inches at the top, to prevent their clambering any higher.

The pigeon-houfe fhould be placed at no great diftance from water, that the pigeons may carry it to their young ones; and their carrying it in their bills will warm it, and render it more wholefome in cold weather. The boards that cover the pigeon-houfe fhould be well joined together, fo that no rain may penetrate through it: and the whole building fhould be covered with hard plafter, and white-wafhed within and without, white being the moft pleafing colour to pigeons. There muft be no window, or other opening in the pigeon-houfe to the eaftward; thefe fhould always face the fouth, for pigeons are very fond of the fun, efpecially in winter.

The nefts or covers in a pigeon-houfe fhould confift of fquare holes made in the walls, of a fize fufficient to admit the cock and hen to ftand in them. The firft range of thefe nefts fhould not be lefs than four feet from the ground, that the wall underneath being fmooth, the rats may not be able to reach them. Thefe nefts fhould be placed in quincunx order, and not directly over one another. Nor muft they be continued any higher than within three feet of the top of the wall: and the upper row fhould be covered with a board projecting a confiderable diftance from the wall, for fear the rats fhould find means to climb the outfide of the houfe.

Pigeon.

M. Duhamel thinks that pigeons neither feed upon the green corn, nor have bills ftrong enough to fcarch for its feeds in the earth; but only pick up the grains that are not covered, which would infallibly become the prey of other animals, or be dried up by the fun. "From the time of the fprouting of the corn, fays he, pigeons live chiefly upon the feeds of wild uncultivated plants, and therefore leffen confiderably the quantity of weeds that would otherwife fpring up; as will appear from a juft eftimate of the quantity of grain neceffary to feed all the pigeons of a well-ftocked dove-houfe." But Mr Worlidge and Mr Lifle allege facts in fupport of the contrary opinion. The latter relates, that a farmer in his neighbourhood affured him he had known an acre fowed with peafe, and rain coming on fo that they could not be harrowed in, every pea was fetched away in half a day's time by pigeons: and the former fays, "It is to be obferved, that where the flight of pigeons falls, there they fill themfelves and away, and return again where they firft rofe, and fo proceed over a whole piece of ground, if they like it. Although you cannot perceive any grain above the ground, they know how to find it. I have feen them lie fo much upon a piece of about two or three acres fown with peafe, that they devoured at leaft three parts in four of the feed, which, I am fure, could not be all above the furface of the ground. That their fmelling is their principal director, I have obferved; having fown a fmall plat of peafe in my garden, near a pigeon-houfe, and covered them fo well that not a pea appeared above ground. In a few days, a parcel of pigeons were hard at work in difcovering this hidden treafure; and in a few days more I had not above two or three peas left out of about two quarts that were planted; for what they could not find before, they found when the buds appeared, notwithftanding they were hoed in, and well covered. Their fmelling alone directed them, as I fuppofed, becaufe they followed the ranges exactly. The injury they do at harveft on the peafe, vetches, &c. is fuch that we may rank them among the greateft enemies the poor hufbandman meets withal; and the greater, becaufe he may not erect a pigeon-houfe, whereby to have a fhare of his own fpoils; none but the rich being allowed this privilege, and fo fevere a law being alfo made to protect thefe winged thieves, that a man cannot encounter them, even in defence of his own property. You have therefore no remedy againft them, but to affright them away by noifes or fuch like. You may, indeed, fhoot at them; but you muft not kill them; or you may, if you can, take them in a net, cut off their tails, and let them go; by which means you will impound them: for when they are in their houfes, they cannot bolt or fly out of the tops of them, but by the ftrength of their tails; after the thus weakening of which, they remain prifoners at home."

Mr Worlidge's impounding the pigeons reminds us of a humorous ftory of a gentleman, who, upon a neighbouring farmer's complaining to him, that his pigeons were a great nuifance to his land, and did fad mifchief to his corn, replied jokingly, Pound them, if you catch them trefpaffing. The farmer, improving the hint, fteeped a parcel of peafe in an infufion of *cocculus indicus*, or fome other intoxicating drug, and ftrewed them upon his grounds. The pigeons fwallowed them, and foon remained motionlefs on the field: upon which the farmer threw a net over them, inclofed them in it, and carried

ried them to an empty barn, from whence he sent the gentleman word that he had followed his directions with regard to the pounding of his pigeons, and desired him to come and release them.

Carrier-PIGEON. See CARRIER-*Pigeon* and COLUMBA, ORNITHOLOGY *Index*.

PIGEON, *Peter Charles Francis*, curate of St Peter du Regard, in the diocese of Bayeux, was one of the priests lately belonging to the king's house at Winchester. He was born in Lower Normandy, of honest and virtuous parents, and of a decent fortune. His inclinations early led him to embrace the ecclesiastical state, from which neither the solicitations of his friends, nor the prospect of a more ample fortune on the death of his elder brother, could withdraw him. Several of his schoolfellows and masters, who are now resident in the king's house at Winchester, bear the most ample testimony to his assiduity, regularity, piety, and the sweetness of his disposition, during the whole course of his education. The sweetness of temper, in particular, was so remarkable, and so clearly depicted on his countenance, as to have gained him the esteem and affection of such of the inhabitants of Winchester as by any means had become acquainted with him. He was seven years employed in quality of vicar, or, as we should call it, *curate*, of a large parish in the diocese of Seez, where his virtues and talents had ample scope for exertion. His practice was to rise at five o'clock every morning, and to spend the whole time till noon (the usual time of dining for persons in his station) in prayer and study. The rest of the day, till evening, he devoted to visiting the sick, and other exterior duties of his function. In 1789, the year of the French revolution, M. Pigeon was promoted to a curacy, or rather a rectory, in the diocese of Bayeux, called the *parish of St Peter du Regard*, near the town of Condè sur Noereau. It was easy for him to gain the good-will and the protection of his parishioners; but a Jacobin club in the above-mentioned town seemed to have no other subject to deliberate upon than the various ways of harassing and persecuting M. Pigeon and certain other priests in the neighbourhood, who had from motives of conscience refused the famous civic oath. It would be tedious to relate the many cruelties which were at different times exercised upon him, and the imminent danger of losing his life to which he was exposed, by the blows that were inflicted on him, by his being thrown into water, and being obliged to wander in woods and other solitary places, without any food or place to lay his head, in order to avoid his persecutors. We may form some judgment of the spirit of his persecutors from the following circumstance. Being disappointed on a particular occasion in the search they were making after M. Pigeon, with the view of amusing themselves with his sufferings, they made themselves amends by seizing his mother, a respectable lady of 74 years of age, and his two sisters, whom they placed upon asses with their faces turned backwards, obliging them in derision to hold the tails of these animals. Thus they were conducted in pain and ignominy throughout the whole town of Condè, for no other alleged crime except being the nearest relations of M. Pigeon. At length the decree for transporting all the ecclesiastics arrived; and this gentleman, with several others, after having been stripped of all their money, was shipped from Port Bessin, and landed at Portsmouth, where he was shortly after received into the establishment at Foxton, and, upon that being dissolved in order to make room for prisoners of war, into the king's house at Winchester. Being of a studious turn, he was accustomed, as many of his brethren also were, to betake himself to the neighbouring lanes and thickets for the sake of greater solitude. With this view having, about ten o'clock in the morning, Aug. 28. 1793, retired to a certain little valley, on the north-east side of a place called *Orant's Arbour*, the same place where the county elections for Hampshire are held, he was there found, between three and four o'clock in the afternoon, murdered, with the upper part of his skull absolutely broken from the lower part, and a large hedge-stake, covered with blood, lying by him, as were the papers on which he had been transcribing a manuscript sermon, with the hearing of which he had been much edified, and the sermon itself which he was copying, together with his pen, imbrued in blood. His watch was carried away, though part of the chain, which had by some means been broken, was left behind. He was writing the word *paradise*, the last letters of which remained unwritten when the fatal blow was given him, which appears evidently to have been discharged upon him from a gap in a hedge which was immediately behind him. At first the suspicion of this cruel murder fell upon the French democrats, who, to the number of 200, are prisoners of war, at the neighbouring town of Alresford, as one of that number, who had broken his parole, had, about three weeks before, been taken up in Winchester, and both there and at Alresford had repeatedly threatened to murder his uncle, a priest, whom he understood to be then at Winchester, not without fervent wishes of having it in his power to murder the whole establishment, consisting of more than 600 persons. However, as no French prisoner was seen that day in the neighbourhood of Winchester, as none of them were known to have left Alresford, it is evidently reasonable to acquiesce in the verdict of the coroner; namely, that the murder was committed by a person or persons unknown. The most noble marquis of Buckingham, whose munificence and kindness to those conscientious exiles, the emigrant French clergy, can only be conceived by those who have been witnesses of the same, with the truly respectable corps of the Buckinghamshire militia then quartered at Winchester, joined in paying the last mark of respect to the unfortunate deceased, by attending his funeral, which was performed at the Roman Catholic burying-ground, called *St James's*, near the said city, on Saturday, Aug. 29. He was just 38 years of age when he was murdered.

PIGMENTS, preparations used by painters, dyers, &c. to impart colours to bodies, or to imitate particular colours. See COLOUR-*Making*, and DYEING.

PIGNEROL is a town of Italy in the province of Piedmont, in E. Long. 7. 15. N. Lat. 44. 45. situated on the river Chizon, 10 miles south-west of Turin, at the foot of the Alps, and the confines of Dauphiny. The town is small, but populous, and extremely well fortified by the king of Sardinia, since the treaty of Utrecht. It is defended by a citadel, on the top of the mountain near which is the castle of Perouse, which was built at the entrance of the valley of that name.

PIGNUT, or *Earthnut*. See BUNIUM, BOTANY *Index*.

Pigus ‖ Pike.

PIGUS, in *Ichthyology*, is the name of a species of leather-mouthed fish, very much resembling the nature of the common carp; being of the same shape and size, and its eyes, fins, and fleshy palate, exactly the same; from the gills to the tail there is a crooked dotted line; the back and sides are bluish, and the belly reddish. It is covered with large scales; from the middle of each of which there rises a fine pellucid prickle, which is very sharp. It is an excellent fish for the table, being perhaps preferable to the carp; and it is in season in the months of March and April. It is caught in lakes in some parts of Italy, and is mentioned by Pliny, though without a name. Artedi says it is a species of cyprinus, and he calls it the *cyprinus*, called *piclo* and *pigus*.

PI-HAHIROTH, (Moses); understood to be a mouth or narrow pass between two mountains, called *Chiroth* or *Eiroth*, and lying not far from the bottom of the western coast of the Arabian gulf; before which mouth the children of Israel encamped, just before their entering the Red sea, (Wells).

PIISKER, in *Ichthyology*, is a fish of the mustela kind, commonly called the *fossile mustela*, or *fossile-fish*. This fish is generally found as long as an ordinary man's hand is broad, and as thick as the finger; but it sometimes grows much longer: the back is of gray, with a number of spots and transverse streaks, partly black and partly blue; the belly is yellow, and spotted with red, white, and black; the white are the larger, the others look as if they were made with the point of a needle; and there is on each of the sides a longitudinal black and white line. There are some fleshy excrescences at the mouth, which are expanded in swimming; and when out of the water, they are contracted. These fishes run into caverns of the earth, in the sides of rivers, in marshy places, and penetrate a great way, and are often dug up at a distance from waters. Often, when the waters of brooks and rivers swell beyond their banks, and again cover them, they make their way out of the earth into the water; and when it deserts them, they are often left in vast numbers upon the ground, and become a prey to swine. It is thought to be much of the same kind with the fisgum fish; and it is indeed possible that the pœcilia of Schonefeldt is the same.

PIKE. See Esox, Ichthyology *Index*.

The pike never swims in shoals as most other fish do, but always lies alone; and is so bold and ravenous, that he will seize upon almost any thing less than himself. Of the ravenous nature of this fish we shall give the following instances. At Rycott in Oxfordshire, in the year 1749, in a moat surrounding the earl of Abingdon's seat, there was a jack or pike of such a monstrous size, that it had destroyed young swans feathers and all. An old cobb swan having hatched five young, one after another was lost till four were gone. At length an under gardener saw the fish seize the fifth. The old one fought him with their beak, and with the assistance of the gardener, released it although he had got it under water. In the year 1765 a large pike was caught in the river Ouze, which weighed upwards of 28 pounds, and was sold for a guinea. On gutting the fish, a watch with a black ribbon and two steel seals were found in its stomach, which, by the maker's name, &c. was found to belong to a person who had been drowned about six weeks before. This fish breeds but once in a year, which is in March. It is found in almost all fresh waters; but is very different in goodness, according to the nature of the places where it lives. The finest pike are those which feed in clear rivers; those in ponds and meres are inferior, and the worst of all are those of the fen ditches. They are very plentiful in these last places, where the water is foul and coloured, and their food, such as frogs and the like, very plentiful, but very coarse; so that they grow large, but are yellowish and high bellied, and differ greatly from those which live in the clearer waters.

Pike.

The fishermen have two principal ways of catching the pike; by the ledger, and by the walking-bait.

The ledger-bait is fixed in one certain place, and may continue while the angler is absent. This must be a live bait, a fish or frog: and among fish, the dace, roach, and gudgeon, are the best; of frogs, the only caution is to choose the largest and yellowest that can be met with. If the bait be a fish, the hook is to be stuck through the upper lip, and the line must be 14 yards at least in length; the other end of this is to be tied to a bough of a tree, or to a stick driven into the ground near the pike's haunt, and all the line wound round a forked stick, except about half a yard. The bait will by this means keep playing so much under water, and the pike will soon lay hold of it.

If the bait be a frog, then the arming wire of the hook should be put in at the mouth, and out at the side; and with a needle and some strong silk, the hinder leg of one side is to be fastened by one stitch to the wire arming of the hook. The pike will soon seize this, and must have line enough to give him leave to get to his haunt and poach the bait.

The trolling for pike is a pleasant method also of taking them: in this a dead bait serves, and none is so proper as a gudgeon.

This is to be pulled about in the water till the pike seizes it; and then it is to have line enough, and time to swallow it: the hook is small for this sport, and has a smooth piece of lead fixed at its end to sink the bait; and the line is very long, and runs through a ring at the end of the rod, which must not be too slender at top.

The art of feeding pike, so as to make them very fat, is the giving them eels; and without this it is not to be done under a very long time; otherwise perch, while small, and their prickly fins tender, are the best food for them. Bream put into a pike-pond are a very proper food: they will breed freely, and their young ones make excellent food for the pike, who will take care that they shall not increase over much. The numerous shoals of roaches and ruds, which are continually changing place, and often in floods get into the pike's quarters, are food for them for a long time.

Pike, when used to be fed by hand, will come up to the very shore, and take the food that is given them out of the fingers of the feeder. It is wonderful to see with what courage they will do this, after a while practising; and it is a very diverting sight when there are several of them nearly of the same size, to see what striving and fighting there will be for the best bits when they are thrown in. The most convenient place is near the mouth of the pond, and where there is about half a yard depth of water; for, by that means, the offal of the feedings will all lie in one place, and the deep water

Pike, Pila.

will ſerve for a place to retire into and reſt in, and will be always clean and in order.

Carp may be fed in the ſame manner as pike; and though by nature a fiſh as remarkably ſhy and timorous as the pike is bold and fearleſs, yet by cuſtom they will come to take their food out of the perſon's hand; and will, like the pike, quarrel among one another for the niceſt bits.

PIKE, in *War*, an offenſive weapon, conſiſting of a wooden ſhaft, 12 or 14 feet long, with a flat ſteel head, pointed, called the *ſpear*. This weapon was long in uſe among the infantry; but now the bayonet, which is fixed on the muzzle of the firelock, is ſubſtituted in its ſtead. It is ſtill uſed by ſome of the officers of infantry, under the name of *ſponton*. The Macedonian phalanx was a battalion of pikemen. See PHALANX.

PILA MARINA, or the *ſea-ball*, in *Natural Hiſtory*, is the name of a ſubſtance very common on the ſhores of the Mediterranean, and elſewhere. It is generally found in the form of a ball about the ſize of the balls of horſe dung, and compoſed of a variety of fibrillæ irregularly complicated. Various conjectures have been given of its origin by different authors. John Bauhine tells us, that it conſiſts of ſmall hairy fibres and ſtraws, ſuch as are found about the ſea plant called *alga vitriariorum*; but he does not aſcertain what plant it owes its origin to. Imperatus imagined it conſiſted of the exuviæ both of vegetable and animal bodies. Mercatus is doubtful whether it be a congeries of the fibrillæ of plants, wound up into a ball by the motion of the ſea water, or whether it be not the workmanſhip of ſome ſort of beetle living about the ſea ſhore, and analogous to our common dung beetle's ball, which it elaborates from dung for the reception of its progeny. Schreckius ſays it is compoſed of the filaments of ſome plant of the reed kind: and Welchius ſuppoſes it is compoſed of the pappous part of the flowers of the reed. Maurice Hoffman thinks it the excrement of the hippopotamus; and others think it that of the phoca or ſea calf. Klein, who had thoroughly and minutely examined the bodies themſelves, and alſo what authors had conjectured concerning them, thinks that they are wholly owing to, and entirely compoſed of, the capillaments which the leaves, growing to the woody ſtalk of the *alga vitriariorum*, have when they wither and decay. Theſe leaves, in their natural ſtate, are as thick as a wheat ſtraw, and they are placed ſo thick about the tops and extremities of the ſtalks, that they enfold, embrace, and lie over one another; and from the middle of theſe cluſters of leaves, and indeed from the woody ſubſtance of the plant itſelf, there ariſe ſeveral other very long, flat, ſmooth, and brittle leaves. Theſe are uſually four from each tuft of the other leaves; and they have ever a common vagina, which is membranaceous and very thin. This is the ſtyle of the plant, and the *pila marina* appears to be a cluſter of the fibres of the leaves of this plant, which cover the whole ſtalk, divided into their conſtituent fibres; and by the motion of the waves firſt broken and worn into ſhort ſhreds, and afterwards wound up together into a roundiſh or longiſh ball.

PILA, was a ball made in a different manner according to the different games in which it was to be uſed. Playing at ball was very common amongſt the Romans of the firſt diſtinction, and was looked upon as a manly exercife, which contributed both to amuſement and health. The pila was of four ſorts: 1ſt, *Follis* or *balloon*; 2d, *Pila Trigonalis*; 3d, *Pila Paganica*; 4th, *Harpaſtum*. All theſe come under the general name of pila. For the manner of playing with each of them, ſee the articles FOLLIS, TRIGONALIS.

Pila ‖ Pilate.

PILASTER, in *Architecture*. See there, N° 50, &c.

PILATE, or PONTIUS PILATE, was governor of Judea when our Lord was crucified. Of his family or country we know but little, though it is believed that he was of Rome, or at leaſt of Italy. He was ſent to govern Judea in the room of Gratus, in the year 26 or 27 of the vulgar era, and governed this province for ten years, from the 12th or 13th year of Tiberius to the 22d or 23d. He is repreſented both by Philo and Joſephus as a man of an impetuous and obſtinate temper, and as a judge who uſed to ſell juſtice, and to pronounce any ſentence that was deſired, provided he was paid for it. The ſame authors make mention of his rapines, his injuries, his murders, the torments that he inflicted upon the innocent, and the perſons he put to death without any form of proceſs. Philo, in particular, deſcribes him as a man that exerciſed an exceſſive cruelty during the whole time of his government, who diſturbed the repoſe of Judea, and gave occaſion to the troubles and revolt that followed after. St Luke (xiii. 1, 2, &c.) acquaints us, that Pilate had mingled the blood of the Galileans with their ſacrifices; and that the matter having been related to Jeſus Chriſt, he ſaid, "Think you that theſe Galileans were greater ſinners than other Galileans, becauſe they ſuffered this calamity. I tell you nay; and if you do not repent, you ſhall all periſh in like manner." It is unknown upon what occaſion Pilate cauſed theſe Galileans to be ſlain in the temple while they were ſacrificing: for this is the meaning of that expreſſion of mingling their blood with their ſacrifices. Some think they were diſciples of Judas the Gaulonite, who taught that the Jews ought not to pay tribute to foreign princes; and that Pilate had put ſome of them to death even in the temple; but there is no proof of this fact. Others think that theſe Galileans were Samaritans, whom Pilate cut to pieces in the village of Tirataba †, as they were preparing to go up to Mount Gerizim, where a certain impoſtor had promiſed to diſcover treaſures to them; but this event did not happen before the year 35 of the common era, and conſequently two years after the death of Jeſus Chriſt. At the time of our Saviour's paſſion, Pilate made ſome endeavours to deliver him out of the hands of the Jews. He knew they had delivered him up, and purſued his life with ſo much violence, only out of malice and envy (Matt. xxvii. 18.). His wife, alſo, who had been diſturbed the night before with frightful dreams, ſent to tell him ſhe deſired him not to meddle in the affair of that juſt perſon (ib. 19.). He attempted to appeaſe the wrath of the Jews, and to give them ſome ſatisfaction, by whipping Jeſus Chriſt (John xix. 1. Matt. xxvii. 26.). He tried to take him out of their hands, by propoſing to deliver him or Barabbas, on the day of the feſtival of the paſſover. Laſtly, he had a mind to diſcharge himſelf from pronouncing judgment againſt him, by ſending him to Herod king of Galilee (Luke xxiii. 7. 8.). When he ſaw all this would not ſatisfy the Jews, and that they even threatened him in ſome manner, ſaying he could be no friend to the emperor if he let him go (John xix. 12, 15.), he cauſed

† *Joſeph. Antiq.* lib. xviii. c. 5.

water

water to be brought, washed his hands before all the people, and publicly declared himself innocent of the blood of that just person (Matt. xxvii. 23, 24.); yet at the same time he delivered him up to his soldiers, that they might crucify him. This was enough to justify Jesus Christ, as Calmet observes, and to show that he held him as innocent; but it was not enough to vindicate the conscience and integrity of a judge, whose duty it was as well to assert the cause of oppressed innocence as to punish the guilty and criminal. He ordered to be put over our Saviour's cross, as it were, an abstract of his sentence, and the motive of his condemnation (John xix. 9.), *Jesus of Nazareth, king of the Jews*, which was written in Latin, Greek, and Hebrew. Some of the Jews found fault with it, and remonstrated to Pilate that he ought to have written *Jesus of Nazareth, who pretended to be king of the Jews*. But Pilate could not be prevailed with to alter it, and gave them this peremptory answer, *That what he had written he had written*.

Towards evening, he was applied to for leave to take down the bodies from the cross, that they might not continue there the following day, which was the passover and the sabbath-day (John xix. 31.). This he allowed, and granted the body of Jesus to Joseph of Arimathea, that he might pay his last duties to it, (ib. 33.). Lastly, when the priests, who had solicited the death of our Saviour, came to desire him to set a watch about the sepulchre, for fear his disciples should steal him away by night, he answered them, that they had a guard, and might place them there themselves (Matt. xxvii. 65.). This is the substance of what the gospel tells us concerning Pilate.

Justin Martyr, Tertullian, Eusebius, and after them several others both ancient and modern, assure us, that it was formerly the custom for Roman magistrates to prepare copies of all verbal processes and judicial acts which they passed in their several provinces, and to send them to the emperor. And Pilate, in compliance to this custom, having sent word to Tiberius of what had passed relating to Jesus Christ, the emperor wrote an account of it to the senate, in a manner that gave reason to judge that he thought favourably of the religion of Jesus Christ, and showed that he should be willing they would decree divine honours to him. But the senate was not of the same opinion, and so the matter was dropped. It appears by what Justin says of these acts, that the miracles of Jesus Christ were mentioned there, and even that the soldiers had divided his garments among them. Eusebius insinuates that they spoke of his resurrection and ascension. Tertullian and Justin refer to these acts with so much confidence as would make one believe they had them in their hands. However, neither Eusebius nor St Jerome, who were both inquisitive, understanding persons, nor any other author that wrote afterwards, seem to have seen them, at least not the true and original acts; for as to what we have now in great number, they are not authentic, being neither ancient nor uniform. There are also some pretended letters of Pilate to Tiberius, giving a history of our Saviour, but they are universally allowed to be spurious.

Pilate being a man that, by his excessive cruelties and rapine, had disturbed the peace of Judea during the whole time of his government, was at length deposed by Vitellius the proconsul of Syria, in the 36th year of Jesus Christ, and sent to Rome to give an account of his conduct to the emperor. But though Tiberius died before Pilate arrived at Rome, yet his successor Caligula banished him to Vienne in Gaul, where he was reduced to such extremity that he killed himself with his own hands. The evangelists call him governor, though in reality he was no more than procurator of Judea, not only because governor was a name of general use, but because Pilate in effect acted as one, by taking upon him to judge in criminal matters; as his predecessors had done, and other procurators in the small provinces of the empire where there was no proconsul, constantly did. See *Calmet's Dictionary*, *Echard's Ecclesiastical Dictionary*, and *Beausobre's Annot.*

With regard to Pilate's wife, the general tradition is, that she was named Claudia Procula or Prosecula; and in relation to her dream, some are of opinion that as she had intelligence of our Lord's apprehension, and knew by his character that he was a righteous person, her imagination, being struck with these ideas, did naturally produce the dream we read of; but others think that this dream was sent providentially upon her, for the clearer manifestation of our Lord's innocence.

PILATRE DU ROZIER, *Francis*, was born at Metz the 30th of March 1756. He was first apprentice to an apothecary there, and afterwards went to Paris in quest of farther improvement. He applied himself to the study of natural history and of natural philosophy, and had already acquired some reputation, when the discovery of M. de Montgolfier had just astonished the learned world. On the 25th of October 1783, he attempted an aerial voyage with the marquis of Arlande. He performed several other excursions in this way with brilliant success, in the presence of the royal family of France, of the king of Sweden, and of Prince Henry of Prussia. He then resolved to pass into England by means of his aerial vehicle, and for that purpose he repaired to Boulogne, whence he rose about 7 o'clock in the morning of the 15th June 1785; but in half an hour after he set out, the balloon took fire, and the aeronaut, with his companion M. Romaine, were crushed to death by the fall of that machine, which was more ingenious, perhaps, than useful *. Pilatre's social virtues and courage, which were very distinguished, heightened the regret of his friends for his loss. His merit as a chemist, and his experiments as an aeronaut, procured him some pecuniary reward, and some public appointments. He had a pension from the king, was intendant of Monsieur's cabinets of natural philosophy, chemistry, and natural history, professor of natural philosophy, a member of several academies, and principal director of Monsieur's museum.

* See *Aerostation*, N° 34.

PILCHARD, in *Ichthyology*, a fish which has a general resemblance to the herring, but differs in some essential particulars. The body of the pilchard is less compressed than that of the herring, being thicker and rounder: the nose is shorter in proportion, and turns up; the under jaw is shorter. The back is more elevated; the belly less sharp. The dorsal fin of the pilchard is placed exactly in the centre of gravity, so that when taken up by it, the body preserves an equilibrium, whereas that of the herring dips at the head. The scales of the pilchard adhere very closely, whereas those of the herring very easily drop off. The pilchard is in general less than the herring; but it is fatter, or more full of oil.

Pilchard, Pile.

The pilchard appears in vaſt ſhoals off the Corniſh coaſts about the middle of July, diſappearing the beginning of winter, yet ſometimes a few return again after Chriſtmas. Their winter retreat is the ſame with that of the herring, and their motives for migrating the ſame †. They affect, during ſummer, a warmer latitude; for they are not found in any quantities on any of our coaſts except thoſe of Cornwall, that is to ſay, from Fowey harbour to the Scilly iſles, between which places the ſhoals keep ſhifting for ſome weeks. The approach of the pilchard is known by much the ſame ſigns as thoſe that indicate the arrival of the herring. Perſons, called in Cornwall *huers*, are placed on the cliffs, to point to the boats ſtationed off the land the courſe of the fiſh. By the 1ſt of James I. c. 23. fiſhermen are empowered to go on the grounds of others to hue, without being liable to actions of treſpaſs, which before occaſioned frequent law-ſuits.

† See *Clupea.*

The emoluments that accrue to the inhabitants of that country are great, and are beſt expreſſed in the words of Dr W. Borlaſe, in his *Account of the Pilchard Fiſhery*. "It employs a great number of men on the ſea, training them thereby to naval affairs; employs men, women, and children, at land, in ſalting, preſſing, waſhing, and cleaning, in making boats, nets, ropes, caſks, and all the trades depending on their conſtruction and ſale. The poor is fed with the offals of the captures; the land with the refuſe of the fiſh and ſalt; the merchant finds the gains of commiſſion and honeſt commerce; the fiſherman, the gains of the fiſh. Ships are often freighted hither with ſalt, and into foreign countries with the fiſh, carrying off at the ſame time part of our tin. The uſual number of hogſheads of fiſh exported each year, for 10 years, from 1747 to 1756 incluſive, from the four ports of Fowey, Falmouth, Penzance, and St Ives, in all amounts to 29,794; ſince it appears that Fowey has exported yearly 1732 hogſheads; Falmouth, 14,631 hogſheads and two-thirds; Penzance and Mounts-Bay, 12,149 hogſheads and one-third; St Ives, 1282 hogſheads. Every hogſhead for ten years laſt paſt, together with the bounty allowed for each when exported, and the oil made out of each, has amounted, one year with another at an average, to the price of 1l. 13s. 3d.; ſo that the caſh paid for pilchards exported has, at a medium, annually amounted to the ſum of 49,532l. 10s." The numbers that are taken at one ſhooting out of the nets is amazingly great. Mr Pennant ſays, that Dr Borlaſe aſſured him, that on the 5th of October 1767, there were at one time incloſed in St Ives's bay 7000 hogſheads, each hogſhead containing 35,000 fiſh, in all 245,000,000.

PILE, in *Heraldry*, an ordinary in form of a wedge, contracting from the chief, and terminating in a point towards the bottom of the ſhield.

PILE, among the Greeks and Romans, was a pyramid built of wood, whereon were laid the bodies of the deceaſed to be burnt. It was partly in the form of an altar, and differed in height according to the quality of the perſon to be conſumed. Probably it might originally be conſidered as an altar, on which the dead were conſumed as a burnt-offering to the infernal deities. The trees made uſe of in the erection of a funeral pile were ſuch as abounded in pitch or roſin, as being moſt combuſtible; if they uſed any other wood, it was ſplit that it might the more eaſily catch fire. Round the pile were placed cypreſs boughs to hinder the noiſome ſmell. See FUNERAL.

Pile.

PILE, in *Building*, is uſed for a large ſtake rammed into the ground in the bottom of rivers, or in marſhy land, for a foundation to build upon.

PILE is alſo uſed among architects for a maſs of building.

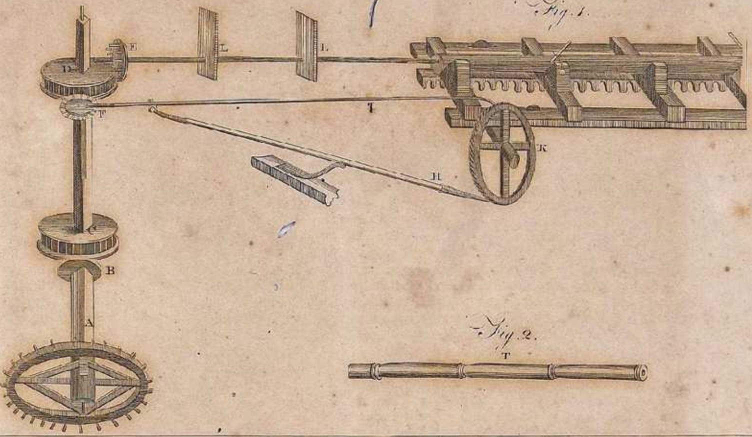
PILE, in *Coinage*, denotes a kind of puncheon, which, in the old way of coining with the hammer, contained the arms or other figure and inſcription to be ſtruck on the coin. See COINAGE.

Accordingly we ſtill call the arms ſide of a piece of money the *pile*, and the head the *croſs*; becauſe in ancient coin, a croſs uſually took the place of the head in ours.

PILE-Engine, a very curious machine invented by Mr Vauloue for driving the piles of Weſtminſter-bridge. A is a great upright ſhaft or axle, on which are the great wheel B, and the drum C, turned by horſes joined to the bars S, S. The wheel B turns the trundle X, on the top of whoſe axis is the fly O, which ſerves to regulate the motion, and alſo to act againſt the horſes, and to keep them from falling when the heavy ram Q is diſcharged to drive the pile P down into the mud in the bottom of the river. The drum C is looſe upon the ſhaft A, but is locked to the wheel B by the bolt Y. On this drum the great rope HH is wound; one end of the rope being fixed to the drum, and the other to the follower G, to which it is conveyed over the pulleys I and K. In the follower G is contained the tongs F, that takes hold of the ram Q by the ſtaple R, for drawing it up. D is a ſpiral or fuſy fixed to the drum, on which is wound the ſmall rope T that goes over the pulley U, under the pulley V, and is faſtened to the top of the frame at 7. To the pulley-block V is hung the counterpoiſe W, which hinders the follower T from accelerating as it goes down to take hold of the ram; for as the follower tends to acquire velocity in its deſcent, the line T winds downwards upon the fuſy, on a larger and larger radius, by which means the counterpoiſe W acts ſtronger and ſtronger againſt it; and ſo allows it to come down with only a moderate and uniform velocity. The bolt Y locks the drum to the great wheel, being puſhed upward by the ſmall lever 2, which goes through a mortiſe in the ſhaft A, turns upon a pin in the bar 3, fixed to the great wheel B, and has a weight 4, which always tends to puſh up the bolt Y through the wheel into the drum. L is the great lever turning on the axis *m*, and reſting upon the forcing bar 5, 5, which goes through a hollow in the ſhaft A, and bears up the little lever 2. Plate CCCCXIX.

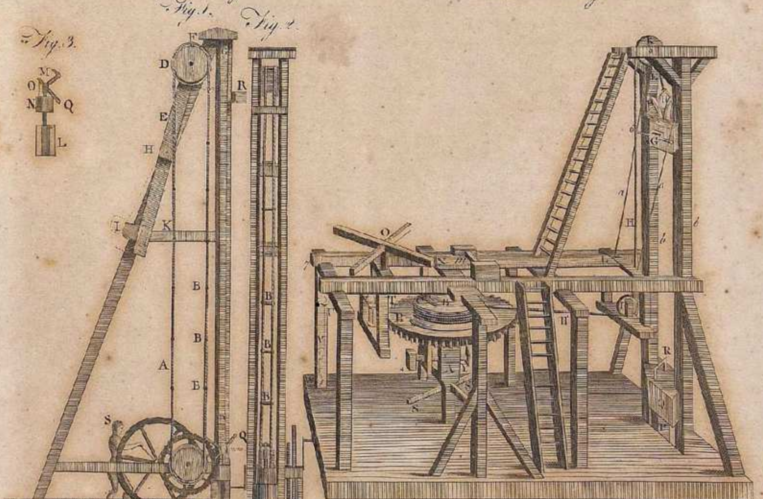
By the horſes going round, the great rope H is wound about the drum C, and the ram Q is drawn up by the tongs F in the follower G, until the tongs come between the inclined planes E; which, by ſhutting the tongs at the top, opens it at the foot, and diſcharges the ram, which falls down between the guides *b b* upon the pile P, and drives it by a few ſtrokes as far into the mud as it will go; after which, the top part is ſawed off cloſe to the mud by an engine for that purpoſe. Immediately after the ram is diſcharged, the piece 6 upon the follower G takes hold of the ropes *a a*, which raiſe the end of the lever L, and cauſes its end N to deſcend and preſs down the forcing bar 5 upon the little lever

Machine for boring wooden PIPES. *PLATE CCCCXIV.*



PILE Engine.

Bunce's PILE Engine. *Vauloue's PILE Engine.*



lever 2, which, by pulling down the bolt Y, unlocks the drum C from the great wheel B; and then the follower being at liberty, comes down by its own weight to the ram; and the lower ends of the tongs ſlip over the ſtaple R, and the weight of their heads cauſes them to fall outward, and ſhut upon it. Then the weight 4 puſhes up the bolt Y into the drum, which locks it to the great wheel, and ſo the ram is drawn up as before.

As the follower comes down, it cauſes the drum to turn backward, and unwinds the rope from it, whilſt the horſes, great wheel, trundle, and fly, go on with an uninterrupted motion; and as the drum is turning backward, the counterpoiſe W is drawn up, and its rope T wound upon the ſpiral fuſy D.

There are ſeveral holes in the under ſide of the drum, and the bolt Y always takes the firſt one that it finds when the drum ſtops by the falling of the follower upon the ram; until which ſtoppage the bolt has not time to ſlip into any of the holes.

This engine was placed upon a barge on the water, and ſo was eaſily conveyed to any place deſired. The ram was a ton weight; and the guides *b b*, by which it was let fall, were 30 feet high.

A new machine for driving piles has been invented by Mr Bunce of Kirby ſtreet, Hatton ſtreet, London. It will drive a greater number of piles in a given time than any other; and can be conſtructed more ſimply to work by horſes than Mr Vauloue's engine above deſcribed.

Plate CCCCXIX. Fig. 1 and 2 repreſent a ſide and front ſection of the machine. The chief parts are A, fig. 1, which are two endleſs ropes, or chains, connected by croſs pieces of iron B (ſee fig. 2), correſponding with two croſs grooves cut diametrically oppoſite in the wheel C (fig. 1.), into which they are received; and by which means the rope or chain A is carried round. FHK is a ſide-view of a ſtrong wooden frame moveable on the axis H. D is a wheel, over which the chain paſſes and turns within at the top of the frame. It moves occaſionally from F to G upon the centre H, and is kept in the poſition F by the weight I fixed to the end K. Fig. 3. L is the iron ram, which is connected with the croſs pieces by the hook M. N is a cylindrical piece of wood ſuſpended at the hook at O, which by ſliding freely upon the bar that connects the hook to the ram, always brings the hook upright upon the chain when at the bottom of the machine, in the poſition of GP. See fig. 1.

When the man at S turns the uſual crane work, the ram being connected to the chain, and paſſing between the guides, is drawn up in a perpendicular direction; and when it is near the top of the machine, the projecting bar Q of the hook ſtrikes againſt a croſs piece of wood at R (fig. 1.); and conſequently diſcharges the ram, whilſt the weight I of the moveable frame inſtantly draws the upper wheel into the poſition ſhown at F, and keeps the chain free of the ram in its deſcent. The hook, while deſcending, is prevented from catching the chain by the wooden piece N. For that piece being

ſpecifically lighter than the iron weight below, and moving with a leſs degree of velocity, cannot come in contact with the iron till it is at the bottom and the ram ſtops. It then falls and again connects the hook with the chain, which draws up the ram, as before.

Mr Bunce has made a model of this machine, which performs perfectly well; and he obſerves, that, as the motion of the wheel C is uninterrupted, there appears to be the leaſt poſſible time loſt in the operation.

PILE-*Worms*, are a kind of worms found in the piles of the ſea-dikes in Holland. They are of very various ſizes; for ſome of the young ones are not above an inch or two in length, while others have been found thirteen or fourteen inches long. The heads of theſe creatures are covered with two hard ſhells or hemicrania; which together form a figure reſembling an augre; and with which they bore the wood. The beſt remedy againſt them is, to perforate the pile with many ſmall holes about an inch aſunder; then it muſt be done over with a varniſh in the hotteſt ſun; and, while the varniſh is hot, brick duſt muſt be ſtrewed over it: and this being ſeveral times repeated, the pile will be covered with a ſtrong cruſt abſolutely impenetrable to all inſects.

PILES, in *Medicine*, the ſame with hæmorrhoids. See Medicine, N° 240, &c.

PILEUS, in Roman antiquity, was the ordinary cap or hat worn at public ſhows and ſacrifices, and by the freedmen. It was one of the common rewards aſſigned to ſuch gladiators as were ſlaves, in token of their obtaining freedom.

PILEWORT, (*Ranunculus ficaria*, Lin.), the root. This is a very ſmall plant, found in moiſt meadows and by hedge ſides. The roots conſiſt of ſlender fibres with ſome little tubercles among them, which are ſuppoſed to reſemble the hæmorrhoids. From thence it has been concluded, that this root muſt needs be of wonderful efficacy for the cure of that diſtemper: to the taſte, it is little other than mucilaginous; and although ſtill retained in ſeveral of the foreign pharmacopœias, it is hardly in uſe in this country.

PILGRIM, one who travels through foreign countries to viſit holy places, and to pay his devotion to the relicks of dead ſaints. See Pilgrimage.

The word is formed from the Flemiſh *pelgrim*, or Italian *pelegrino*, which ſignifies the ſame; and thoſe originally from the Latin *peregrinus*, a "ſtranger or traveller."

PILGRIMAGE, a kind of religious diſcipline, which conſiſts in taking a journey to ſome holy place in order to adore the relicks of ſome deceaſed ſaint. Pilgrimages began to be made about the middle ages of the church; but they were moſt in vogue after the end of the 11th century, when every one was for viſiting places of devotion, not excepting kings and princes themſelves; and even biſhops made no difficulty of being abſent from their churches on the ſame account. The places moſt viſited were Jeruſalem, Rome, Compoſtella (A), and Tours; but the greateſt numbers now reſort

(A) It deſerves to be remarked here, that in the year 1428, under the reign of Henry VI. abundance of licences were granted from the crown of England to captains of Engliſh ſhips, for carrying numbers of devout perſons to the ſhrine of St James of Compoſtella in Spain; provided, however, that thoſe pilgrims ſhould firſt take an oath not

reſort to Loretto, in order to viſit the chamber of the bleſſed virgin, in which ſhe was born, and brought up her ſon Jeſus till he was 12 years of age. For the pilgrimage of the followers of Mahomet, ſee MAHOMETANISM.

In every country where popery was eſtabliſhed, pilgrimages were common; and in thoſe countries which are ſtill popiſh, they continue. In England, the ſhrine of St Thomas à Becket was the chief reſort of the pious; and in Scotland, St Andrews; where, as tradition informs us, was depoſited a leg of the holy apoſtle. In Ireland they ſtill continue; for, from the beginning of May till the middle of Auguſt every year, crowds of popiſh penitents from all parts of that county reſort to an iſland near the centre of *Lough-ſin*, or *White Lake*, in the county of Donnegal, to the amount of 3000 or 4000. Theſe are moſtly of the poorer ſort, and many of them are proxies for thoſe who are richer; ſome of which, however, together with ſome of the prieſts and biſhops on occaſion, make their appearance there. When the pilgrim comes within ſight of the holy lake, he muſt uncover his hands and feet, and thus walk to the water ſide, and is taken to the iſland for ſixpence. Here there are two chapels and 15 other houſes; to which are added confeſſionals, ſo contrived, that the prieſt cannot ſee the perſon confeſſing. The penance varies according to the circumſtances of the penitent; during the continuance of which (which is ſometimes three, ſix, or nine days) he ſubſiſts on oatmeal, ſometimes made into bread. He traverſes ſharp ſtones on his bare knees or feet, and goes through a variety of other forms, paying ſixpence at every different confeſſion. When all is over, the prieſt bores a gimblet-hole through the pilgrim's ſtaff near the top, in which he faſtens a croſs peg; gives him as many holy pebbles out of the lake as he cares to carry away, for amulets to be preſented to his friends, and ſo diſmiſſes him, an object of veneration to all other papiſts not thus initiated, who no ſooner ſee the pilgrim's croſs in his hands, than they kneel down to get his bleſſing.

There are, however, other parts of Ireland ſacred to extraordinary worſhip and pilgrimage; and the number of holy wells, and miraculous cures, &c. produced by them, is very great. That ſuch things ſhould exiſt in this enlightened age, and in a Proteſtant country, is indeed ſtrange; but our wonder ceaſes, when we reflect that it is among the loweſt, and perhaps the worſt of the people. They who carry external religion to an extreme, and place that confidence in ceremony which belongs only to the ſpirit of it, are ſeldom diſtinguiſhed either for their wiſdom or their virtue. We do not deny, however, that they who carry matters to the other extreme, may be equally deſtitute of real knowledge and genuine morality.

Dr Johnſon, in his *Raſſelas*, gives us ſome obſervations on pilgrimage, which are ſo much to the purpoſe, that we think we cannot do better than lay them before our readers. "Pilgrimage (ſaid Imlac, into whoſe mouth the obſervations are put), like many other acts of piety, may be reaſonable or ſuperſtitious according to the principles upon which it is performed. Long journeys in ſearch of truth are not commanded. Truth, ſuch as is neceſſary to the regulation of life, is always found where it is honeſtly ſought: change of place is no natural cauſe of the increaſe of piety, for it inevitably produces diſſipation of mind. Yet ſince men go every day to view the fields where great actions have been performed, and return with ſtronger impreſſions of the event, curioſity of the ſame kind may naturally diſpoſe us to view that country whence our religion had its beginning: and I believe no man ſurveys thoſe awful ſcenes without ſome confirmation of holy reſolutions. That the Supreme Being may be more eaſily propitiated in one place than in another, is the dream of idle ſuperſtition; but that ſome places may operate upon our own minds in an uncommon manner, is an opinion which hourly experience will juſtify. He who ſuppoſes that his vices may be more ſucceſsfully combated in Paleſtine, will, perhaps, find himſelf miſtaken; yet he may go thither without folly: he who thinks they will be more freely pardoned, diſhonours at once his reaſon and religion."

PILKINGTON, LÆTITIA, a famous poetical genius, the daughter of Dr Van Lewin, a phyſician of Dublin, where ſhe was born in 1712. She was married very young to the Rev. Matthew Pilkington, a poet alſo of no inconſiderable merit; and the two wits, as is often the caſe, lived very unhappily together. They were at length totally ſeparated, on the huſband accidentally diſcovering a gentleman in her bedchamber at two o'clock in the morning; a circumſtance which ſhe accounted for in a very unſatiſfactory manner. The ſtory is told at large in her Memoirs; where ſhe ſays, "Lovers of learning, I am ſure, will pardon me, as I ſolemnly declare it was the attractive charms of a new book, which the gentleman would not lend me, but conſented to ſtay till I read it through, that was the ſole motive of my detaining him." As there are not wanting ſome who form objections to marrying learned wives, the chance of ſuch literary aſſignations may perhaps be added to the liſt of them. After this unlucky adventure, Mrs Pilkington came to London; and having recourſe to her pen for ſubſiſtence, through the means of Colley Cibber, ſhe lived for ſome time on the contributions of the great. She was however thrown into the Marſhalſea for debt; and being ſet at liberty, opened a pamphlet ſhop. She raiſed at length a handſome ſubſcription for her Memoirs; which are written with great ſprightlineſs and wit, containing ſeveral entertaining anecdotes of Dean Swift, with whom ſhe was intimate, as well as many pretty little pieces of her own poetry. This ingenious woman is ſaid at laſt to have killed herſelf with drinking. She died at Dublin, in 1750.

PILL, in *Pharmacy*, a form of medicine reſembling a little ball, to be ſwallowed whole; invented for ſuch as

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not to take any thing prejudicial to England, not to reveal any of its ſecrets, nor to carry out with them any more gold or ſilver than what would be ſufficient for their reaſonable expences. In this year there went out thither from England, on the ſaid pilgrimage, the following number of perſons. From London 280, Briſtol 200, Weymouth 122, Dartmouth 90, Yarmouth 60, Jerſey 60, Plymouth 40, Exeter 30, Poole 24, Ipſwich 20, in all 926 perſons.

as cannot take bitter and ill-taſted medicinal draughts: as alſo to keep in readineſs for occaſional uſe without decaying. See Materia Medica *Index*.

PILLAR, in *Architecture*. See Architecture.

Pillar, in the manege, is the centre of the ring, or manege-ground, round which a horſe turns, whether there be a pillar in it or not. Beſides this, there are pillars on the circumference or ſides of the manege-ground, placed at certain diſtances, by two and two, from whence they are called the *two pillars*, to diſtinguiſh them from that of the centre. The uſe of the pillar in the centre is for regulating the extent of ground, that the manege upon the volts may be performed with method and juſtneſs, and that they may work in a ſquare, by rule and meaſure, upon the four lines of the volts; and alſo to break unruly high-mettled horſes, without endangering the rider. The two pillars are placed at the diſtance of two or three paces one from the other; and the horſe is put between thoſe, to teach him to riſe before and yerk out behind, and put himſelf upon raiſed airs, &c. either by the aids or chaſtiſements.

Pompey's Pillar. See Alexandria.

PILLARS, in antiquarian topography, are large ſingle ſtones ſet up perpendicularly. Thoſe of them which are found in this country have been the work of the Druids; but as they are the moſt ſimple of all monuments, they are unqueſtionably more ancient than druidiſm itſelf. They were placed as memorials recording different events; ſuch as remarkable inſtances of God's mercies, contracts, ſingular victories, boundaries, and ſometimes ſepulchres. Various inſtances of theſe monuments erected by the patriarchs occur in the Old Teſtament: ſuch was that raiſed by Jacob at Luz, afterwards by him named *Bethel*; ſuch alſo was the pillar placed by him over the grave of Rachel. They were likewiſe marks of execrations and magical taliſmans.

Theſe ſtones, from having long been conſidered as objects of veneration, at length were by the ignorant and ſuperſtitious idolatrouſly worſhipped; wherefore, after the introduction of Chriſtianity, ſome had croſſes cut on them, which was conſidered as ſnatching them from the ſervice of the devil. Vulgar ſuperſtition of a later date has led the common people to conſider them as perſons transformed into ſtone for the puniſhment of ſome crime, generally that of ſabbath-breaking; but this tale is not confined to ſingle ſtones, but is told alſo of whole circles: witneſs the monuments called the *hurlers* in Cornwall, and *Rollorick ſtones* in Warwickſhire. The firſt are by the vulgar ſuppoſed to have been once men, and thus transformed as a puniſhment for playing on the Lord's day at a game called *hurling*; the latter, a pagan king and his army.

At Wilton, where the earl of Pembroke has a very magnificent houſe, there is a pillar of one piece of white Egyptian granite, which was brought from the temple of Venus Genetrix at Rome, near 14 feet high and 22 inches diameter, with an inſcription to Aſtarte or Venus.

PILLORY (*colliſtrigium*, "collum ſtringens;" *pilloria*, from the French *pilleur*, i. e. *depeculator*; or *pelori*, derived from the Greek πυλη, *janua*, a "door," becauſe one ſtanding on the pillory puts his head as it were through a door, and ορασ, *video*), is an engine made of wood to puniſh offenders, by expoſing them to public view, and rendering them infamous. There is a *ſtatute of the pillory*, 51 Hen. III. And by ſtatute it is appointed for bakers, foreſtallers, and thoſe who uſe falſe weights, perjury, forgery, &c. 3 *Inſt.* 219. Lords of leets are to have a pillory and tumbrel, or it will be the cauſe of forfeiture of the leet; and a village may be bound by preſcription to provide a pillory, &c. 2 *Hawk.* P. C. 73.

PILOT, the officer who ſuperintends the navigation, either upon the ſea-coaſt or on the main ocean. It is, however, more particularly applied by our mariners to the perſon charged with the direction of a ſhip's courſe on or near the ſea-coaſt, and into the roads, bays, rivers, havens, &c. within his reſpective diſtrict.

Pilots of ſhips, taking upon them to conduct any ſhip from Dover, &c. to any place up the river Thames, are to be firſt examined and approved by the maſter and wardens of the ſociety of Trinity Houſe, &c. or ſhall forfeit 10l. for the firſt offence, 20l. for the ſecond, and 40l. for every other offence; one moiety to the informer, the other to the maſter and wardens; but any maſter or mate of a ſhip may pilot his own veſſel up the river: and if any ſhip be loſt through the negligence of any pilot, he ſhall be for ever after diſabled to act as a pilot. 3 Geo. I. c. 13. Alſo the lord-warden of the cinque ports may make rules for the government of pilots, and order a ſufficient number to ply at ſea to conduct ſhips up to the Thames: 7 Geo. I. c. 21. No perſon ſhall act as a pilot on the Thames, &c. (except in collier ſhips) without a licence from the maſter and wardens of Trinity Houſe at Deptford, on pain of forfeiting 20l. And pilots are to be ſubject to the government of that corporation; and pay ancient dues, not exceeding 1s. in the pound, out of wages, for the uſe of the poor thereof. Stat. 5 Geo. II. c. 20.

By the former laws of France, no perſon could be received as pilot till he had made ſeveral voyages and paſſed a ſtrict examination; and after that, on his return in long voyages, he was obliged to lodge a copy of his journal in the admiralty; and if a pilot occaſioned the loſs of a ſhip, he had to pay 100 livres fine, and to be for ever deprived of the exerciſe of pilotage; and if he did it deſignedly, be puniſhed with death. *Lex Mercat.* 70, 71.

The laws of Oleron ordain, That if any pilot deſignedly miſguide a ſhip, that it may be caſt away, he ſhall be put to a rigorous death, and hung in chains: and if the lord of a place, where a ſhip be thus loſt, abet ſuch villains in order to have a ſhare of the wreck, he ſhall be apprehended, and all his goods forfeited for the ſatiſfaction of the perſons ſuffering: and his perſon ſhall be faſtened to a ſtake in the midſt of his own manſion, which, being fired on the four corners, ſhall be burned to the ground, and he with it. *Leg. Ol.* c. 25. And if the fault of a pilot be ſo notorious that the ſhip's crew ſee an apparent wreck, they may lead him to the hatches, and ſtrike off his head; but the common law denies this haſty execution: an ignorant pilot is ſentenced to paſs thrice under the ſhip's keel by the laws of Denmark. *Lex Mercat.* 70.

The regulations with regard to pilots in the royal navy are as follow: "The commanders of the king's ſhips, in order to give all reaſonable encouragement to ſo uſeful a body of men as pilots, and to remove all their objections

Pilot.

jections to his majesty's service, are strictly charged to treat them with good usage, and an equal respect with warrant-officers.

"The purser of the ship is always to have a set of bedding provided on board for the pilots; and the captain is to order the boatswain to supply them with hammocks, and a convenient place to lie in, near their duty, and apart from the common men; which bedding and hammocks are to be returned when the pilots leave the ship.

"A pilot, when conducting one of his majesty's ships in pilot-water, shall have the sole charge and command of the ship, and may give orders for steering, setting, trimming, or furling the sails; tacking the ship; or whatever concerns the navigation; and the captain is to take care that all the officers and crew obey his orders. But the captain is diligently to observe the conduct of the pilot; and if he judges him to behave so ill as to bring the ship into danger, he may remove him from the command and charge of the ship, and take such methods for her preservation as shall be judged necessary; remarking upon the log book, the exact hour and time when the pilot was removed from his office, and the reasons assigned for it.

"Captains of the king's ships, employing pilots in foreign parts of his majesty's dominions, shall, after performance of the service, give a certificate thereof to the pilot, which being produced to the proper naval officer, he shall cause the same to be immediately paid; but if there be no naval officer there, the captain of his majesty's ship shall pay him, and send the proper vouchers, with his bill, to the navy-board, in order to be paid as bills of exchange.

"Captains of his majesty's ships, employing foreign pilots to carry the ships they command into or out of foreign ports, shall pay them the rates due by the establishment or custom of the country, before they discharge them: whose receipts being duly vouched, and sent, with a certificate of the service performed, to the navy-board, they shall cause them to be paid with the same exactness as they do bills of exchange." *Regulations and Instructions of the Sea-service*, &c.

PILOT-Fish. See GASTEROSTEUS, ICHTHYOLOGY *Index*.

Osbec tells us, that they are shaped like those mackerels which have a transverse line upon the body. "Sailors (continues he) give them the name of *pilots*, because they closely follow the dog-fish, swimming in great shoals round it on all sides. It is thought that they point out some prey to the dog-fish. They are not only not touched, but also preserved by it against all their enemies.

It likewise follows the shark, apparently for the purpose of devouring the remains of its prey. It is pretended that it acts as its pilot. The manner in which it attends the shark, according to M. Daubenton, may have given rise to this name. It is said to swim at the height of a foot and a half from the snout of this voracious animal, to follow and imitate all its movements, and to seize with address every part of its prey which the shark allows to escape, and which is light enough to buoy up towards the surface of the water. When the shark, which has its mouth below, turns to seize any fish, the pilot-fish starts away; but as soon as the shark resumes his ordinary position, it returns to its former place. It is said, that in the gulf of Guinea those fishes follow ships for the sake of the offals and human excrements; and hence the Dutch give them the name of *dung-fish*. It is remarkable, that though so small they can keep pace with ships in their swiftest course.

Pilot || Pimento.

PILTEN, a division of Courland, which lies in Courland properly so called, derives its name from the ancient castle or palace of Pilten, built by Valdemar II. king of Denmark about the year 1220, when he founded a bishop's see in this country for the more effectual conversion of its Pagan inhabitants. This district afterwards successively belonged to the Germans, then again to the king of Denmark, the duke of Courland, and to Poland; and by virtue of the instrument of regency drawn up for this district in the year 1717, the government is lodged in seven Polish senators or counsellors, from whom an appeal lies to the king. The bishop of Samogitia also styles himself bishop of Pilten.

The most remarkable part of this district is the promontory of Domesness, which projects northward into the gulf of Livonia. From this cape, a sand-bank runs four German miles farther into the sea, half of which lies under water, and cannot be discerned. To the east of this promontory is an unfathomable abyss, which is never observed to be agitated. For the safety of vessels bound to Livonia, two square beacons have been erected on the coast near Domesness church, opposite to the sand bank, and facing each other. One of these is twelve fathoms high, and the other eight; and a large fire is kept burning on them from the first of August to the first of January. When the mariners see these fires appear as one in a direct line, they may conclude that they are clear of the extremity of the sand bank, and consequently out of danger; but if they see both beacons, they are in danger of running upon it. The district of Pilten contains seven parishes, but no towns worthy of notice. The inhabitants are chiefly of the Lutheran persuasion.

PILUM, a missive weapon used by the Roman soldiers, and in a charge darted upon the enemy. Its point, we are told by Polybius, was so long and small, that after the first discharge it was generally so bent as to be rendered useless. The legionary soldiers made use of the pilum, and each man carried two. The pilum underwent many alterations and improvements, insomuch that it is impossible with any precision to describe it. Julius Scaliger laboured much to give an accurate account of it, and would have esteemed success on this head amongst the greatest blessings of his life. This weapon appears, however, to have been sometimes round, but most commonly square, to have been two cubits long in the staff, and to have had an iron point of the same length hooked and jagged at the end. Marius made a material improvement in it; for during the Cimbrian war, he so contrived it, that when it stuck in the enemies shield it should bend down in an angle in the part where the wood was connected with the iron, and thus become useless to the person who received it.

PIMENTO, PIEMENTO, JAMAICA PEPPER, or *All-spice*, a species of myrtus. See MYRTUS, BOTANY *Index*.

"The pimento trees grow spontaneously, and in great abundance, in many parts of Jamaica, but more particularly on hilly situations near the sea, on the northern side of that island; where they form the

moſt delicious groves that can poſſibly be imagined; filling the air with fragrance, and giving reality, though in a very diſtant part of the globe, to our great poet's deſcription of thoſe balmy gales which convey to the delighted voyager

'Sabean odours from the ſpicy ſhore
'Of Araby the bleſt.
'Cheer'd with the grateful ſmell, old ocean ſmiles.'

"This tree is purely a child of nature, and ſeems to mock all the labours of man in his endeavours to extend or improve its growth: not one attempt in fifty to propagate the young plants, or to raiſe them from the ſeeds, in parts of the country where it is not found growing ſpontaneouſly, having ſucceeded. The uſual method of forming a new pimento plantation (in Jamaica it is called a *walk*) is nothing more than to appropriate a piece of woodland, in the neighbourhood of a plantation already exiſting, or in a country where the ſcattered trees are found in a native ſtate, the woods of which being fallen, the trees are ſuffered to remain on the ground till they become rotten and periſh. In the courſe of twelve months after the firſt ſeaſon, abundance of young pimento plants will be found growing vigorouſly in all parts of the land, being without doubt produced from ripe berries ſcattered there by the birds, while the fallen trees, &c. afford them both ſhelter and ſhade. At the end of two years it will be proper to give the land a thorough cleanſing, leaving ſuch only of the pimento trees as have a good appearance, which will then ſoon form ſuch groves as thoſe I have deſcribed, and except perhaps for the firſt four or five years, require very little attention afterwards.

"Soon after the trees are in bloſſom, the berries become fit for gathering; the fruit not being ſuffered to ripen on the tree, as the pulp in that ſtate, being moiſt and glutinous, is difficult to cure, and when dry becomes black and taſteleſs. It is impoſſible, however, to prevent ſome of the ripe berries from mixing with the reſt; but if the proportion of them be great, the price of the commodity is conſiderably injured.

"It is gathered by the hand; one labourer on the tree, employed in gathering the ſmall branches, will give employment to three below (who are generally women and children) in picking the berries; and an induſtrious picker will fill a bag of 70lbs. in the day.

"The returns from a pimento walk in a favourable ſeaſon are prodigious. A ſingle tree has been known to yield 150lbs. of the raw fruit, or one cwt. of the dried ſpice; there being commonly a loſs in weight of one third in curing; but this, like many other of the minor productions, is exceedingly uncertain, and perhaps a very plenteous crop occurs but once in five years."

PIMPINELLA, Burnet Saxifrage; a genus of plants belonging to the pentandria claſs. See Botany *Index*.

PIMPLE, in *Medicine*, a ſmall puſtule ariſing on the face. By mixing equal quantities of the juice of houſe-leek (*ſedum minus*), paſſed through paper, and of ſpirit of wine rectified by itſelf, a white coagulum of a very volatile nature is formed, which Dr Bughart commends for curing pimples of the face; and ſays, that the thin liquor ſeparated from it with ſugar-candy is an excellent remedy for thick viſcid phlegm in the breaſt.

PIN, in commerce, a little neceſſary inſtrument made of braſs-wire, chiefly uſed by women in faſtening and adjuſting their dreſs.

In the year 1543, by ſtatute 34 and 35 of Henry VIII. cap. 6. it was enacted, "That no perſon ſhall put to ſale any pinnes but only ſuch as ſhall be double-headed, and have the heads ſoldered faſt to the ſhank of the pins, well ſmoothed, the ſhank well-ſhapen, the points well and round filed, canted, and ſharpened." From the above extract it ſhould appear that the art of pin-making was but of late invention, probably introduced from France; and that our manufactories ſince that period have wonderfully improved.

Though pins are apparently ſimple, their manufacture is, however, not a little curious and complex. We ſhall therefore give our readers an account of it from Ellis's *Campagna* of London.

"When the braſs-wire, of which the pins are formed, is firſt received at the manufactory, it is generally too thick for the purpoſe of being cut into pins. The firſt operation therefore is that of winding it off from one wheel to another with great velocity, and cauſing it to paſs between the two, through a circle in a piece of iron of ſmaller diameter: the wire being thus reduced to its proper dimenſions, is ſtraitened by drawing it between iron pins, fixed on a board in a zig-zag manner, but ſo as to leave a ſtraight line between them: afterwards it is cut into lengths of three or four yards, and then into ſmaller ones, every length being ſufficient to make ſix pins; each end of theſe is ground to a point, which was performed when I viewed the manufactory by boys who ſat each with two ſmall grinding ſtones before him, turned by a wheel. Taking up a handful, he applies the ends to the coarſeſt of the two ſtones, being careful at the ſame time to keep each piece moving round between his fingers, ſo that the points may not become flat: he then gives them a ſmoother and ſharper point, by applying them to the other ſtone, and by that means a lad of 12 or 14 years of age is enabled to point about 16,000 pins in an hour. When the wire is thus pointed, a pin is taken off from each end, and this is repeated till it is cut into ſix pieces. The next operation is that of forming the heads, or, as they term it, *head-ſpinning*; which is done by means of a ſpinning-wheel, one piece of wire being thus with aſtoniſhing rapidity wound round another, and the interior one being drawn out, leaves a hollow tube between the circumvolutions: it is then cut with ſheers; every two circumvolutions or turns of the wire forming one head; theſe are ſoftened by throwing them into iron pans, and placing them in a furnace till they are red hot. As ſoon as they are cold, they are diſtributed to children, who ſit with anvils and hammers before them, which they work with their feet, by means of a lathe, and taking up one of the lengths, they thruſt the blunt end into a quantity of the heads which lie before them, and catching one at the extremity, they apply them immediately to the anvil and hammer, and by a motion or two of the foot, the point and the head are fixed togther in much leſs time than can it be deſcribed, and with a dexterity only to be acquired by practice; the ſpectator being in continual apprehenſion

fion for the fafety of their fingers ends. The pin is now finifhed as to its form, but ftill it is merely brafs; it is therefore thrown into a copper, containing a folution of tin and the leys of wine. Here it remains for fome time; and when taken out affumes a white though dull appearance: in order therefore to give it a polifh, it is put into a tub containing a quantity of bran, which is fet in motion by turning a fhaft that runs through its centre, and thus by means of friction it becomes perfectly bright. The pin being complete, nothing remains but to feparate it from the bran, which is performed by a mode exactly fimilar to the winnowing of corn; the bran flying off and leaving the pin behind fit for immediate fale. I was the more pleafed with this manufactory, as it appeared to afford employment to a number of children of both fexes, who are thus not only prevented from acquiring the habits of idlenefs and vice, but are on the contrary initiated in their early years in thofe of a beneficial and virtuous induftry." See NEEDLES.

PINACIA, among the Athenians, were tablets of brafs infcribed with the names of all thofe citizens in each tribe who were duly qualified and willing to be judges of the court of Areopagus. Thefe tablets were caft into a veffel provided for the purpofe, and the fame number of beans, a hundred being white and all the reft black, were thrown into another. Then the names of the candidates and the beans were drawn out one by one, and they whofe names were drawn out together with the white beans were elected judges or fenators. In Solon's time there were only four tribes, each of which chofe 100 fenators; but the number of tribes afterwards increafing, the number of fenators and judges increafed to fo many hundreds more.

PINANG, the Chinefe name of the *Areca Catechu* Lin. See ARECA, BOTANY *Index*.

PINCHBECK, a factitious metallic fubftance, or an alloy of zinc three parts, and of copper, four. See CHEMISTRY *Index*.

PINDAR, the prince of lyric poets, was born at Thebes, about 520 years B. C. He received his firft mufical inftructions from his father, who was a fluteplayer by profeffion; after which, according to Suidas, he was placed under Myrtis, a lady of diftinguifhed abilities in lyric poetry. It was during this period that he became acquainted with the poetefs Corinna, who was likewife a ftudent under Myrtis. Plutarch tells us, that Pindar profited from the leffons which Corinna, more advanced in her ftudies, gave him at this fchool. It is very natural to fuppofe, that the firft poetical effufions of a genius fo full of fire and imagination as that of Pindar would be wild and luxuriant; and Lucian has preferved fix verfes, faid to have been the exordium of his firft effay; in which he crowded almoft all the fubjects for fong which ancient hiftory and mythology then furnifhed. Upon communicating this attempt to Corinna, fhe told him fmiling, that he fhould fow with the hand, and not empty his whole fack at once. Pindar, however, foon quitted the leading ftrings of thefe ladies, his poetical nurfes, and became the difciple of Simonides, now arrived at extreme old age: after which he foon furpaffed all his mafters, and acquired great reputation over all Greece: but, like a true prophet, he was lefs honoured in his own country than elfewhere; for at Thebes he was frequently pronounced to be vanquifhed, in the mufical and poetical contefts, by candidates of inferior merit.

The cuftom of having thefe public trials of fkill in all the great cities of Greece was now fo prevalent, that but little fame was to be acquired by a mufician or poet any other way than by entering the lifts; and we find, that both Myrtis and Corinna publicly difputed the prize with him at Thebes. He obtained a victory over Myrtis, but was vanquifhed five different times by Corinna. The judges, upon occafions like thefe, have been frequently accufed of partiality or ignorance, not only by the vanquifhed, but by pofterity; and if the merit of Pindar was pronounced inferior to that of Corinna five feveral times, it was, fays Paufanias, becaufe the judges were more fenfible to the charms of beauty than to thofe of mufic and poetry (A). Was it not ftrange, faid the Scythian Anacharfis, that the Grecian artifts were never judged by artifts, their peers?

Pindar, before he quitted Thebes, had the vexation to fee his Dithyrambics traduced, abufed, and turned into ridicule, by the comic poets of his time; and Athenæus tells us, that he was feverely cenfured by his brother lyrics, for being a lipogrammatift, and compofing an ode from which he had excommunicated the letter S. Whether thefe cenfures proceeded from envy or contempt cannot now be determined; but they were certainly ufeful to Pindar, and it was neceffary that he fhould be lafhed for fuch puerilities. Thebes feems to have been the purgatory of our young bard: when he quitted that city, as his judgement was matured, he avoided moft of the errors for which he had been chaftifed, and fuddenly became the wonder and delight of all Greece. Every hero, prince, and potentate, defirous of lafting fame, courted the mufe of Pindar.

He feems frequently to have been prefent at the four great feftivals, of the Olympian, Pythian, Nemean, and Ifthmian games, as may be inferred from feveral circumftances and expreffions in the odes which he compofed for the victors in them all. Thofe at Olympia, who were ambitious of having their achievements celebrated by Pindar, applied to him for an ode, which was firft fung in the Prytaneum or town-hall of Olympia, where there was a banqueting room, fet apart for the entertainment of the conquerors. Here the ode was rehearfed by a chorus, accompanied by inftruments. It was afterwards performed in the fame manner at the triumphal entry of the victor into his own country, in proceffions, or at the facrifices that were made with great pomp and folemnity on the occafion.

Pindar,

(A) Paufanias fays, that Corinna was one of the moft beautiful women of her time, as he judged by a picture of her which he faw at Tanagris at the place where the public exercifes were performed. She was reprefented with her head ornamented by a riband, as a memorial of the victories fhe had obtained over Pindar at Thebes.

Pindar, in his ſecond Iſthmian ode, has apologized for the mercenary cuſtom among poets, of receiving money for their compoſitions. "The world (ſays he) is grown intereſted, and thinks in general with the Spartan philoſopher Ariſtodemus, that *money only makes the man*: a truth which this ſage himſelf experienced, having with his riches loſt all his friends." It is ſuppoſed that Pindar here alludes to the avarice of Simonides, who firſt allowed his muſe to ſell her favours to the higheſt bidder.

There is no great poet in antiquity whoſe moral character has been leſs cenſured than that of Pindar. Plutarch has preſerved a ſingle verſe of his *Epicedium* or *Dirge* that was ſung at his funeral; which, ſhort and ſimple as it is, implies great praiſe: *This man was pleaſing to ſtrangers, and dear to his fellow-citizens.* His works abound with precepts of the pureſt morality; and it does not appear that he ever traduced even his enemies; comforting himſelf, for their malignity, by a maxim which he inſerted in his firſt *Pythic*, and which afterwards became proverbial, *That it is better to be envied than pitied.*

Pauſanias ſays, that the character of poet was truly conſecrated, in the perſon of Pindar, by the god of verſe himſelf; who was pleaſed, by an expreſs oracle, to order the inhabitants of Delphos to ſet apart for Pindar one half of the firſt-fruit offerings brought by the religious to his ſhrine, and to allow him a conſpicuous place in his temple, where, in an iron chair, he uſed to ſit and ſing his hymns in honour of that god. This chair was remaining in the time of Pauſanias, ſeveral centuries after, and ſhown to him as a relick not unworthy of the ſanctity and magnificence of that place.

But though Pindar's muſe was penſioned at Delphos, and well paid by princes and potentates elſewhere, ſhe ſeems, however, ſometimes to have ſung the ſpontaneous ſtrains of pure friendſhip. Of this kind were, probably, the verſes beſtowed upon the muſician Midas, of Agrigentum in Sicily, who had twice obtained the palm of victory by his performance on the flute at the Pythic games (B). It is in his 12th Pythic ode that Pindar celebrates the victory of Midas *over all Greece, upon that inſtrument which Minerva herſelf had invented* (C).

Fabricius tells us, that Pindar lived to the age of 90; and, according to the chronology of Dr Blair, he died 435 years B. C. aged 86. His fellow citizens erected a monument to him in the Hippodrome at Thebes, which was ſtill ſubſiſting in the time of Pauſanias; and his renown was ſo great after his death, that his poſterity derived very conſiderable honours and privileges from it. When Alexander the Great attacked the city of Thebes, he gave expreſs orders to his ſoldiers to ſpare the houſe and family of Pindar. The Lacedæmonians had done the ſame before this period; for when they ravaged Bœotia and burned the capital, the following words were written upon the door of the poet: *Forbear to burn this houſe; it was the dwelling of Pindar.* Reſpect for the memory of this great poet continued ſo long, that, even in Plutarch's time, the beſt part of the ſacred victim at the Theoxenian feſtival was appropriated to his deſcendants.

PINDARIC ODE, in *Poetry*, an ode formed in imitation of the manner of Pindar. See POETRY, N° 135, &c.

PINDUS, in *Ancient Geography*, not a ſingle mountain, but a chain of mountains, inhabited by different people of Epirus and Theſſaly; ſeparating Macedonia, Theſſaly, and Epirus: An extenſive chain, having Macedonia to the north, the Perrhœbi to the weſt, the Dolopes to the ſouth, and the mountain itſelf of Theſſaly (Strabo).

PINDUS, a Doric city of Ætolia, ſituated on the cognominal river, which falls into the Cephiſſus (Strabo).

PINE, in *Botany*. See PINUS, BOTANY *Index*.

PINE-Apple. See BROMELIA, BOTANY *Index*; and for an account of the mode of cultivating the pine-apple, ſee GARDENING.

PINEA, or PIGNE, in commerce, is a term uſed in Peru and Chili, for a kind of light, porous maſſes, or lumps, formed of a mixture of mercury and ſilver-duſt from the mines. The ore, or mineral, of ſilver, when dug out of the veins of the mine, is firſt broken and then ground in mills for the purpoſe, driven by water with iron peſtles, each of 200 pounds weight. The mineral, when thus pulverized, is next ſifted, and then worked up with water into a paſte; which, when half dry, is cut into pieces, called *cuerpos*, a foot long, weighing each about 2500 pounds.

Each piece or cuerpo is again kneaded up with ſea-ſalt, which, diſſolving, incorporates with it. They then add mercury, from 10 to 20 pounds for each cuerpo, kneading the paſte afreſh until the mercury be incorporated therewith. This office, which is exceedingly dangerous on account of the noxious qualities of the mercury, is always made the lot of the poor Indians. This amalgamation is continued for eight or nine days; and ſome add lime, lead, or tin ore, &c. to forward it; and, in ſome mines, they are obliged to uſe fire. To try whether or no the mixture and amalgamation be ſufficient, they waſh a piece in water; and if the mercury be white, it is a proof that it has had its effect: if black, it muſt be ſtill farther worked.

(B) This Midas is a very different perſonage from his long-eared majeſty of Phrygia, whoſe deciſion in favour of Pan had given ſuch offence to Apollo; as is manifeſt, indeed, from his having been cotemporary with Pindar.

(C) The moſt extraordinary part of this muſician's performance that can be gathered from the ſcholiaſt upon Pindar, was his finiſhing the ſolo, without a reed or mouth-piece, which broke accidentally while he was playing. The legendary account given by the poet in this ode, of the occaſion upon which the flute was invented by Minerva, is diverting: "It was (ſays he) to imitate the howling of the Gorgons, and the hiſſing of their ſnakes, which the goddeſs had heard when the head of Meduſa (one of theſe three anti-graces) was cut off by Perſeus."

ed. When finished, it is sent to the lavatories, which are large basons that empty successively into one another. The paste, &c. being laid in the uppermost of these, the earth is then washed from it into the rest by a rivulet turned upon it; an Indian, all the while, stirring it with his feet, and two other Indians doing the like in the other basons. When the water runs quite clear out of the basons, the mercury and silver are found at bottom incorporated. This matter they call *pella*, and of this they form the pineas, by expressing as much of the mercury as they can; first, by putting it in woollen bags, and pressing and beating it strongly; then, by stamping it in a kind of wooden mould, of an octagonal form, at bottom whereof is a brass plate pierced full of little holes. The matter, when taken out of the mould, is laid on a trivet, under which is a large vessel full of water; and the whole being covered with an earthen head, a fire is made round it.

The mercury still remains in the mass, and is thus reduced into fumes, and, at length, condensing, it is precipitated into the water, leaving behind it a mass of silver grains of different figures, which, only joining or touching at the extremes, render the matter very porous and light. This, therefore, is the pinea, or pigne, which the workmen endeavour to sell secretly to vessels trading to the South sea; and from which those, who have ventured to engage in so dangerous a commerce, have made such vast gains. Indeed the traders herein must be very careful; for the Spanish miners are arrant knaves, and to make the pignes weigh the more, they often fill the middle with sand or iron.

PINEAL GLAND. See BRAIN, ANATOMY *Index*.

PINEAU, GABRIEL DU, a distinguished lawyer, was born at Angers in 1573. He went afterwards to Paris, and pled with eclat before the parliament and great council. Upon his return to Angers, he became a counsellor in the presidial court. He was consulted by all the neighbouring provinces, and had an active hand in all the great affairs of his time. Mary de Medicis conferred upon him the office of master of requests, and in her disgrace wished to support herself by his credit and counsels; but Du Pineau, always attentive to what he owed on the one hand to the mother of his king, and on the other to the king himself, never ceased to inspire that princess with sentiments of peace.

In 1632 Louis XIII. by way of reward, appointed him mayor and captain-general of the city of Angers; a situation in which he merited the flattering title of *Father of the People*. He had no respect of persons; for he was equally accessible to the poor and the great. This worthy citizen died the 15th of October 1644, at the age of 71. His house was a kind of academy, where regular conferences were held, and attended by young officers, advocates, and other literary characters. In those conferences every one freely stated the difficulties which occurred to him upon subjects either of law or history; and when Pineau spoke, all was made clear; but he was always the last in delivering his sentiments, because he perceived that too much deference was paid to his opinion. His writings are, 1. Latin notes, in addition to those of Du Moulin, upon the canon law, and printed along with the works of that eminent lawyer by the care of Francis Pinson. 2. Commentaries, observations, and consultations, upon several important questions respecting the laws both of Anjou and of France, with some dissertations upon different subjects, &c. reprinted in 1725, in 2 vols folio, by the care of Livoniere, who has enriched them with very useful remarks. The editor says, that "Du Pineau is a little inferior to the celebrated Du Moulin on the civil law, but that he is more accurate than the other upon the canon law."—Menage made these two verses upon his death:

> *Pinellus periit, Themidis pius ille sacerdos,*
> *In proprio judex limine perpetuus.*

PINEDA, JOHN, a writer of history, was born at Seville of a noble family, and entered into the society of Jesuits in 1572. He taught philosophy and divinity in several colleges; and devoted his time to the study of the Holy Scriptures. That he might render that study the easier, he made himself master of the oriental languages. We have of his writings, 1. Two volumes of Commentaries upon the book of Job, in folio. 2. Two upon Ecclesiastes. 3. A General History of the Church, in Spanish, 4 vol. in folio. 4. A History of Ferdinand III. in the same language, in folio. He died in 1637, much regretted by the members of his society, and by the public in general.

PINELLI, JOHN VINCENT, a distinguished literary character, was born at Naples, and was son of Count Pinelli, a noble Genoese, who had settled in that city, and had acquired a handsome fortune in the way of trade. After receiving a liberal education, he quitted the place of his nativity, and repaired to Padua, where he took up his residence at the age of 24. Being a great lover of science, he gave a preference to that city on account of its famous university, which brought to it a number of learned men. He had an excellent library, which consisted of a choice collection of books and manuscripts, and which he continued to enrich till the hour of his death. His literary correspondence, not only in Italy, but through the most of Europe, procured him all the new works which were worthy of a place in his collection. The authors themselves were often forward to pay their respects to him. In many cities of Italy he had persons employed to search, at least once a month, the stalls of those artificers who make use of old parchments, such as lute-makers, sievewrights, and others; and by this means he had the good fortune often to save from destruction some valuable fragments. His passion for knowledge embraced all the sciences; but history, medals, antiquities, natural history, and particularly botany, were his favourite studies. He was consulted from all quarters, and the extent of his acquaintance with the learned world was very great. He corresponded with Justus Lipsius, Joseph Scaliger, Sigonius, Possevin, Peter Pithou, and a great many others, who have all paid the highest compliments to his erudition. Insensible to all the pleasures of life, and acquainted only with those of the mind, he had a great dislike to plays, entertainments, shows, and every thing which most excites the curiosity of other men. During the space of 43 years that he lived at Padua, he was never known to be out of the city but twice; once on occasion of a plague which infested it; and afterwards on a voyage to Naples, which he made at the earnest solicitation of his friends. In short, Pinelli was generous,

Pinelli || Ping-leang-fou.

ous, sympathizing, and compassionate, particularly to men of letters, whose wants he often anticipated. His zeal for the progress and advancement of science rendered him very communicative of his knowledge and of his books; but this was always done with judgment and discretion. He died in 1601, aged 68, without having published any work. Paul Gualdo, who has written Pinelli's life, does not specify the number of volumes of which his rich library consisted: he only informs us, that when it was transported by sea to Naples, it was packed up in 130 chests, of which 14 contained manuscripts; but it did not go wholly to his heirs. The senate of Venice caused their seal to be set upon the manuscripts, and took away whatever concerned the affairs of the republic, to the number of 200 pieces.—"I compare (says President de Thou) Pinelli to Titus Pomponius; for, as that illustrious Roman was called *Attick*, Pinelli also bore the title of *Venetian*, on account of the great affection which the republic of Venice had for him.

PINET, Antony du, lord of Noroy, an ecclesiastical writer, who lived in the 16th century, and was a native of Besançon in France. He was strongly attached to the Protestant religion, and a bitter enemy to the church of Rome. His book, entitled *La Conformité des Eglises Reformés de France, et de l'Eglise primitive*, printed at Lyons, 1564, in 8vo; and the notes which he added to the French translation of the Fees of the Pope's Chancery, which was printed at Lyons, in 8vo, 1564, and reprinted at Amsterdam in 1700, in 12mo, plainly discover his sentiments. He published the last-mentioned performance under this title: *Taxé des parties casuelles de la boutique du Pape*, in Latin and French, with some notes taken from decrees, councils, and canons, in order to ascertain the discipline anciently observed in the church. In the epistle dedicatory, he assumes the tone of a declared enemy to the court of Rome. He apologizes for having presented this book "to a society so holy as yours (the Protestants), in which are heard only hymns, psalms, and praises, to the Lord our God: but it is proper to show to the villain his villany, and the fool his folly, lest one should be thought to resemble them." We see by this specimen, that Pinet had no more politeness in his style than in his manners. His translation of Pliny's Natural History, printed at Lyons in 2 vol. folio, 1566, and at Paris, 1608, was formerly much read. Though there are many errors in it, it is yet very useful, especially for those who do not understand Pliny's Latin, on account of the translators researches, and a great number of marginal notes. Pinet also published "Plans of the principal fortresses in the world," at Lyons, 1564, in folio,

Grosier's General Description of China, vol. i. p. 92.

PING-LEANG-FOU, a city of China in the province of Chen-si. It is one of the most considerable cities of the western part of the province, and is situated on the river Kin-ho. The air here is mild; and the agreeable views which the surrounding mountains present, added to the streams which water the country, render it a very delightful residence. It has under its jurisdiction three cities of the second class and seven of the third. In this district is a valley so deep and narrow, that it is almost impervious to the light: a large highway, paved with square stones, runs through it.

Pinguicula || Pinnoterus.

PINGUICULA, Butterwort; a genus of plants belonging to the diandria class. See Botany *Index*.

PINGUIN, or Penguin, in *Ornithology*, a genus of birds of the order anseres. See Aptenodytes, Ornithology *Index*, or page 507.

PINION, in *Mechanics*, an arbor, or spindle, in the body whereof are several notches, which catch the teeth of a wheel that serves to turn it round; or it is a lesser wheel that plays in the teeth of a larger.

PINK, a name given to a ship with a very narrow stern; whence all vessels, however small, whose sterns are fashioned in this manner, are called *pink sterned*.

PINK. See Dianthus, Botany *Index*.

PINNA, in *Zoology*, a genus of shell-fish belonging to the order of vermes testacea. See Conchology *Index*.—Pliny, who gives some account, perhaps not very correct, of the history of some of the species of this genus (lib. ix. 51.) says, the smallest of all the kinds is called the *pinnoteres*, and therefore liable to injury; this has the prudence to hide itself in the shells of oysters. Again, lib. ix. 66. he says, the pinna is of the genus of shell-fish; it is produced in muddy waters, always erect, nor ever without a companion, which some call the *pinnoteres*, others the *pinnophylax*. This sometimes is a small squill, sometimes a crab, that follows the pinna for the sake of food. The pinna, upon opening its shell, exposes itself as a prey to the smallest kind of fishes; for they immediately assault her, and, growing bolder upon finding no resistance, venture in. The guard, watching its time, gives notice by a bite; upon which the pinna, closing its shell, shuts in, kills, and gives part of whatever happens to be there to its companion.

The pinna and the crab together dwell,
For mutual succour, in one common shell.
They both to gain a livelihood combine;
That takes the prey, when this has given the sign.
From hence this crab, above his fellows fam'd,
By ancient Greeks was *pinnoteres* nam'd.—Oppian.

PINNACE, a small vessel navigated with oars and sails, and having generally two masts, which are rigged like those of a schooner.

Pinnace is also a boat usually rowed with eight oars. See the article Boat.

PINNACLE, in *Architecture*, the top or roof of a house, terminating in a point. This kind of roof among the ancients was appropriated to temples; their ordinary roofs were all flat, or made in the platform way.

PINNATED leaves. See Botany *Index*.

PINNATIFID leaves. See Botany *Index*.

PINNOTERUS, or Pinnophylax, is a kind of crab-fish, furnished with very good eyes. It is said to be the companion of the pinna marina. They live and lodge together in the same shell, which belongs to the latter. When it has occasion to eat, it opens its valves, and sends out its faithful purveyor to procure food. If during their labour the pinnoterus perceives the polypus, it immediately returns to warn its blind friend of the danger, when, by shutting its valves, it escapes the rage of its enemy; but when the pinnoterus loads itself with booty without molestation, it makes a gentle noise at the opening of the shell, and when admitted

mitted the two friends feaſt on the fruits of its induſtry. See PINNA, &c.

PINT (*pinta*), a veſſel or meaſure, uſed in eſtimating the quantity of liquids, and even ſometimes of dry things.—Budæus derives the word from the Greek πινθα; others from the German *pint*, a little meaſure of wine; Nicod from the Greek πινειν, "to drink."

The *Engliſh pint* is twofold; the one for wine meaſure, the other for beer and ale meaſure. See MEASURE.

PINTADA, a ſpecies of PROCELLARIA.

PINTLES, certain points or hooks faſtened upon the back part of the rudder, with their points downwards, in order to enter into, and reſt upon, the *googings*, fixed in the ſtern-poſt, to hang the rudder. See HELM.

PINTOR, PETER, phyſician, was born at Valentia in Spain, in the year 1420, and was phyſician to Alexander VI. whom he followed to Rome, where he practiſed with great ſucceſs. He has left behind him two performances of conſiderable merit, 1. *Aggregator Sententiarum Doctorum de Curatione in Peſtilentia*, printed at Rome 1499, in folio. 2. *De Morbo Fœdo et Occulto his Temporibus Aſſligenti*, &c. printed at Rome, 1500, in 4to, black letter: a book extremely ſcarce, unknown to Luiſini and Aſtruc, and which traces the venereal diſeaſe to the year 1496. Pintor died at Rome in 1503, aged 83 years.

PINTURICCIO, BERNARDINO, a celebrated Italian painter, was born at Peruſia in 1454. He was the diſciple of Peter Perugino, under whom he became ſo good an artiſt, that he employed him on many occaſions as his aſſiſtant. He principally painted hiſtory and groteſque; but he alſo excelled in portraits, among which thoſe of Pope Pius II. and Innocent VIII. of Giulia Farneſe, Cæſar Borgia, and Queen Iſabella of Spain, are particularly diſtinguiſhed. The moſt memorable performance of Pinturiccio is the hiſtory of Pius II. painted in ten compartments in the monaſtery of Sienna; in which undertaking, Raphael, then a young man, and bred under the ſame maſter, aſſiſted him ſo far as to ſketch out cartoons of many parts of the compoſition. The ſtory of his death is worth relating, eſpecially as it illuſtrates his character. The laſt work he was engaged in was a *Nativity* for the monaſtery of St Francis at Sienna: the monks accommodated him with a chamber to work in, which they cleared of all the furniture, except one old trunk or cheſt that appeared too rotten to move; but Pinturiccio, naturally poſitive and peeviſh, inſiſted on its being taken away, and the monks, willing to gratify him, complied. It was no ſooner ſtirred than one of the planks burſting, out tumbled 500 pieces of gold, which had been ſecreted there for many years. The monks were overjoyed at finding this treaſure, and the painter proportionably mortified at loſing his chance of the diſcovery by his indiſcreet obſtinacy: it affected his ſpirits ſo much that he ſurvived but a few months, and it was generally conſidered as the cauſe of his death.

PINUS, the PINE-TREE; a genus of plants belonging to the monœcia claſs. See BOTANY *Index*. The pine-tree was well known to the ancients, and has been deſcribed and celebrated both by their philoſophers and poets. Pliny enumerates no leſs than ſix ſpecies of trees of this genus; and it is mentioned by Virgil both in his Eclogues, his Georgics, and his Æneid; by Horace in his Odes; by Ovid in his Metamorphoſes; by Statius; and by Catullus, &c. Macrobius relates an anecdote concerning the cones of pine-trees, which in common language were called *poma pinea*, "pine-apples." There lived in the Auguſtan age one Vatinius, who by ſome means had irritated the Roman people ſo much that they pelted him with ſtones. When he entertained them with gladiators, to ſave himſelf from ſuch treatment for the future, he procured an edict from the ediles, that no perſon ſhould throw any thing but apples in the amphitheatre. It accidentally happened that at this time Caſcellius, eminent for his wit as well as knowledge of the law, was conſulted on the queſtion, whether a pine-apple (the cone of the pine) was legally included in the term *pomum*, "an apple?" It is an apple (ſaid he) if you intend to fling it at Vatinius*. A deciſion by which the edict in his favour did not much mend his ſituation: for Martial repreſents it dangerous to come under this tree, becauſe the cones in his time were of ſo great a ſize and weight, probably enlarged by cultivation for ages.

* Saturn. lib. ii. cap. 6.

Nuces Pineæ.

Poma ſumus Cybeles: procul hinc diſcede, viator,
Ne cadat in miſerum noſtra ruina caput †.

† Lib. xiii. Ep. 25.

There are generally reckoned 14 ſpecies of this genus; of which the moſt remarkable are theſe following:

1. The *pinea*, *pineaſter*, or wild pine, grows naturally on the mountains in Italy and the ſouth of France. It grows to the ſize of a large tree; the branches extend to a conſiderable diſtance; and while the trees are young, they are fully garniſhed with leaves, eſpecially where they are not ſo cloſe as to exclude the air from thoſe within; but as they advance in age, the branches appear naked, and all thoſe which are ſituated below become unſightly in a few years; for which reaſon they are now much leſs in eſteem than formerly.

2. The *pinus pinea*, or ſtone pine, is a tall evergreen tree, native of Italy and Spain. It delights in a ſandy loam, though like moſt others it will grow well in almoſt any land. Reſpecting the uſes of this ſpecies, Hanbury tells us that "the kernels are eatable, and by many preferred to almonds. In Italy they are ſerved up at table in their deſſerts.—They are exceeding wholeſome, being good for coughs, colds, conſumptions, &c. on which account only this tree deſerves to be propagated." Hanbury continues: "It may be very proper here to take notice of a very great and dangerous miſtake Mr Miller has committed, by ſaying, under his article of ſtone-pine, that ſeeds kept in the cones will be good, and grow if they are ſown ten or twelve years after the cones have been gathered from the trees; whereas the ſeeds of this ſort, whether kept in the cones or taken out, are never good after the firſt year; and though ſometimes a few plants will come up from the ſeeds that are kept in the cones for two years before, yet this is but ſeldom; neither muſt a tenth part of a crop be expected. This caution is the more neceſſary, as ſeveral gentlemen who had cones, upon reading Mr Miller's book, and finding the ſeeds would take no damage when kept there, deferred the work for a ſeaſon or two, when they thought they ſhould have more conveniency either of men or ground for their purpoſe; and were afterwards wholly diſappointed, no plants appearing,

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pearing, the feeds being by that time fpoiled and worth nothing."

3. The *rubra*, commonly called the *Scots fir* or *pine*. It is common throughout Scotland, whence its name; though it is alfo found in moft of the other countries of Europe. M. du Hamel, of the Royal Academy of Sciences, mentions his having received fome feeds of it from St Domingo in the Weft Indies; and thence concludes, that it grows indifferently in the temperate, frigid, and torrid zones. The wood of this tree is the red or yellow deal, which is the moft durable of any of the kinds yet known. The leaves of this tree are much fhorter and broader than thofe of the former fort, of a grayifh colour, growing two out of one fheath; the cones are fmall, pyramidal, and end in narrow points; they are of a light colour, and the feeds are fmall.

4. The *pinus picea*, or yew-leaved fir, is a tall evergreen, and a native of Scotland, Sweden, and Germany. This fpecies includes the filver fir and the balm of Gilead fir. The firft of thefe is a noble upright tree. Mr Marfham fays, "The talleft trees I have feen were fpruce and filver firs in the valleys in Switzerland. I faw feveral firs in the dockyards in Venice 40 yards long; and one of 39 yards was 18 inches diameter at the fmall end. I was told they came from Switzerland."

Treatife on Planting and Ornamental Gardening.

The branches are not very numerous, and the bark is fmooth and delicate. The leaves grow fingly on the branches, and their ends are flightly indented. Their upper furface is of a fine ftrong green colour, and their under has an ornament of two white lines running lengthwife on each fide the midrib; on account of which filvery look this fort is called the *filver fir*. The cones are large, and grow erect; and, when the warm weather comes on, they foon fhed their feeds; which fhould be a caution to all who wifh to raife this plant, to gather the cones before that happens.

The balm of Gilead fir has of all the forts been moft coveted, on account of the great fragrance of its leaves; though this is not its only good property: for it is a very beautiful tree, naturally of an upright growth, and the branches are fo ornamented with their balmy leaves, as to exceed any of the other forts in beauty. The leaves, which are very clofely fet on the branches, are broad; and their ends are indented. Their upper furface, when healthy, is of a fine dark-green colour, and their under has white lines on each fide the midrib lengthwife, nearly like thofe of the filver fir. Thefe leaves when bruifed are very finely fcented; and the buds, which fwell in the autumn for the next year's fhoot, are very ornamental all winter, being turgid, and of a fine brown colour: and from thefe alfo exudes a kind of fine turpentine, of the fame kind of (though heightened) fragrancy. The tree being wounded in any part, emits plenty of this turpentine; and Hanbury fays, "it is fuppofed by many to be the fort from whence the balm of Gilead is taken, which occafions this tree being fo called. But this is a miftake; for the true balm of Gilead is taken from a kind of terebinthus: though I am informed, that what has been collected from this tree has been fent over to England from America (where it grows naturally), and often fold in the fhops for the true fort."

The filver fir is very hardy, and will grow in any foil or fituation, but always makes the greateft progrefs in rich loamy earth. The balm of Gilead fir muft be planted in deep, rich, good earth; nor will it live long in any other. The foil may be a black mould, or of a fandy nature, if it be deep enough, and if the roots have room enough to ftrike freely.

Pinus.

5. The *pinus abies*, or European fpruce fir, a native of the northern parts of Europe and of Afia, includes the Norway fpruce and long-coned Cornifh fir. The former of thefe is a tree of as much beauty while growing as its timber is valuable when propagated on that account. Its growth is naturally like the filver, upright: and the height it will afpire to may be eafily conceived, when we fay that the white deal, fo much coveted by the joiners, &c. is the wood of this tree; and it may perhaps fatisfy the curious reader to know, that from this fir pitch is drawn. The leaves are of a dark-green colour; they ftand fingly on the branches, but the younger fhoots are very clofely garnifhed with them. They are very narrow; their ends are pointed; and they are poffeffed of fuch beauties as to excite admiration. The cones are eight or ten inches long, and hang downwards. *Ibid.*

The better the foil is, the fafter will the fpruce fir grow, though it will thrive very well in moft of our Englifh lands. In ftrong loamy earth it makes a furprifing progrefs; and it delights in frefh land of all forts, which never has been worn out by ploughing, &c. though it be ever fo poor. The long-coned Cornifh fir differs fcarcely in any refpect from the Norway fpruce, except that the leaves and the cones are larger.

6. The *pinus Canadenfis*, American or Newfoundland fpruce fir, a native of Canada, Pennfylvania, and other parts of North America, includes three varieties. The white Newfoundland fpruce, the red Newfoundland fpruce, and the black Newfoundland fpruce. Thefe, however, differ fo little, that one defcription is common to them all. They are of a genteel upright growth, though they do not fhoot fo freely or grow fo faft with us as the Norway fpruce. The leaves are of the fame green, and garnifh the branches in the fame beautiful manner as thofe of that fpecies; only they are narrower, fhorter, and ftand clofer. The greateft difference is obfervable in the cones; for thefe are no more than about an inch in length, and the fcales are clofely placed. In the cones, indeed, confifts the difference of thefe three forts: thofe of the white fpecies are of a very light brown colour; thofe of the red fpecies more of a nut-brown or reddifh colour; and thofe of the black fpecies of a dark or blackifh colour. Befides this, there is fcarcely any material difference; though it is obfervable, that this trifling variation feems to be pretty conftant in the plants raifed from the like feeds. Thefe forts will often flower, and produce cones when only about five or fix feet high; and indeed look then very beautiful: but this is a fign of weaknefs in the plant, which it does not often fairly get over.

7. The *pinus balfamea*, or hemlock fir, a native of Virginia and Canada, poffeffes as little beauty as any of the fir tribe; though, being rather fcarce in proportion, it is deemed valuable. It is called by fome the *yew-leaved fir*, from the refemblance of the leaves to thofe of the yew-tree. It is a tree of low growth, with but few branches; and thefe are long and flender, and fpread abroad without order. The leaves do not garnifh the

Pinus. branches so plentifully as those of any other sort of fir. The cones are very small and rounded; they are about half an inch long; and the scales are loosely arranged. We receive these cones from America, by which we raise the plants; though this caution should be given to the planter, that this tree is fond of moist rich ground, and in such a kind of soil will make the greatest progress.

8. The *pinus orientalis*, or oriental fir, a native of the East, is a low but elegant tree. The leaves are very short, and nearly square. The fruit is exceeding small, and hangs downward; and the whole tree makes an agreeable variety with the other kinds.

9. The *strobus*, Lord Weymouth's pine, or North American white pine. This grows sometimes to the height of 100 feet and upwards, and is highly valued on account of its beauty. The bark of the tree is very smooth and delicate, especially when young; the leaves are long and slender, five growing out of one sheath; the branches are pretty closely garnished with them, and thus make a fine appearance. The cones are long, slender, and very loose, opening with the first warmth of the spring; so that if they are not gathered in winter, the scales open and let out the seeds. The wood of this sort is esteemed for making masts for ships. In Queen Anne's time there was a law made for the preservation of these trees, and for the encouragement of their growth in America. Within these last 50 years they have been propagated in Britain in considerable plenty.

With respect to the culture of this species, Mr Hanbury, after some more general directions, continues thus, "I have known gentlemen, who, in attempting to raise these trees, have seen the young plants go off without perceiving the cause; and the more watering and pains they have taken, have found the plants perish in this way more and more, to their great mortification and astonishment. In the spring following these plants should be pricked out in beds half a foot asunder each way; and here they may stand two years, when they may be either finally planted out, or removed into the nursery, at the distance of one foot asunder, and two feet in the rows. If care has been taken of them in the nursery, they may be removed at a considerable height with great assurance of success: for it is much easier to make this pine grow than any of the other sorts: so that where they are wanted for ornament in parks, open places, &c. a show of them may be made in a little time.

"The soil the Weymouth pine delights in most is a sandy loam; but it likes other soils of an inferior nature: and although it is not generally to be planted on all lands like the Scotch fir, yet I have seen it luxuriant and healthy, making strong shoots, on blue and red clays, and other sorts of strong ground. On stony and slaty ground, likewise, I have seen some very fine trees; so that I believe whoever is desirous of having plantations of this pine, need not be curious in the choice of his ground."

10. The *pinus tæda*, or swamp-pine, is a tall evergreen tree, a native of the swamps of Virginia and Canada. There are several varieties of this genus which Hanbury enumerates and describes: such as, 1st, The three-leaved American swamp-pine. 2d, The two-leaved American pine. 3d, The yellow American pine, the yellow tough pine, and the tough pine of the plains; among which there is but little variety. 4th, The bastard pine. 5th, The frankincense pine. And 6th, the dwarf pine. Pinus.

"There are (continues our author) many other sorts of American pines, which we receive from thence with the like cant names of those of the above, which I have chosen to retain, as they will probably be continued to be sent over; and that the gardener receiving them as such may best know what to do with them. In many of those sorts I see at present no material difference; so am induced to think they are the same, sent over with different names. Some of the sorts above mentioned differ in very few respects; but I have chosen to mention them, as a person may be supplied with the seeds from Pennsylvania, Jersey, Virginia, Carolina, &c. where they all grow naturally: and having once obtained the seeds, and from them plants, they will become pleasing objects of his nicest observations."

11. The *pinus cedrus*, ranked by Tournefort and others under larix, famous for its duration, is that popularly called by us the *cedar of Lebanon*, by the ancients *cedrus magna* or the *great cedar*; also *cedrelate*, κιδρελατη; and sometimes the Phœnician or Syrian cedar, from the country where it grows in its greatest perfection. It is a coniferous evergreen, of the bigger sort, bearing large roundish cones of smooth scales, standing erect, the leaves being small, narrow, and thick set.—They sometimes counterfeit cedar, by dyeing wood of a reddish hue: but the smell discovers the cheat, that of true cedar being very aromatic. In some places, the wood of the cajou-tree passes under the name of cedar, on account of its reddish colour and its aromatic smell, which somewhat resemble that of santal. Cedar-wood is reputed almost immortal and incorruptible; a prerogative which it owes chiefly to its bitter taste, which the worms cannot endure. For this reason it was that the ancients used cedar tablets to write upon, especially for things of importance, as appears from that expression of Persius, *Et cedra digna locutus*. A juice was also drawn from cedar, with which they smeared their books and writings, or other matters, to preserve them from rotting; which is alluded to by Horace: by means of which it was, that Numa's books, written on papyrus, were preserved entire to the year 535, as we are informed by Pliny.

Solomon's temple, as well as his palace, were both of this wood. That prince gave King Hiram several cities for the cedars he had furnished him on these occasions. Cortes is said to have erected a palace at Mexico, in which were 7000 beams of cedar, most of them 120 feet long, and 12 in circumference, as we are informed by Herrera. Some tell us of a cedar felled in Cyprus 130 feet long, and 18 in diameter. It was used for the main-mast in the galley of King Demetrius. Le Bruyn assures us, that the two biggest he saw on Mount Lebanon, measured, one of them 57 palms, and the other 47, in circumference. In the temple of Apollo at Utica, there were cedar trees near 2000 years old; which yet were nothing to that beam in an oratory of Diana at Seguntum in Spain, said to have been brought thither 200 years before the destruction of Troy. Cedar is of so dry a nature, that it will not endure to be fastened with iron nails, from which it usually shrinks; so that they commonly fasten it with pins of the same wood.

"The

Pinus.

"The statue (says Hanbury) of the great goddess at Ephesus was made of this material; and, if this tree abounded with us in great plenty, it might have a principal share in our most superb edifices. The effluvia constantly emitted from its wood are said to purify the air, and make rooms wholesome. Chapels and places set apart for religious duties, being wainscotted with this wood, inspire the worshippers with a more solemn awe. It is not obnoxious to worms; and emits an oil which will preserve cloth or books from worms or corruption. The saw-dust will preserve human bodies from putrefaction; and is therefore said to be plentifully used in the rites of embalming, where practised."

It is remarkable that this tree is not to be found as a native in any other part of the world than Mount Libanus, as far as hath yet been discovered. What we find mentioned in Scripture of the lofty cedars can be nowise applicable to the common growth of this tree; since, from the experience we have of those now growing in England, as also from the testimony of several travellers who have visited those few remaining trees on Mount Libanus, they are not inclined to grow very lofty, but on the contrary extend their branches very far; to which the allusion made by the Psalmist agrees very well, when he is describing the flourishing state of a people, and says, "They shall spread their branches like the cedar-tree."

Rauwolf, in his Travels, says, there were not at that time (i. e. anno 1574) upon Mount Libanus more than 26 trees remaining, 24 of which stood in a circle; and the other two, which stood at a small distance, had their branches almost consumed with age; nor could he find any younger tree coming up to succeed them, though he looked about diligently for some. These trees (he says) were growing at the foot of a small hill on the top of the mountains, and amongst the snow. These having very large branches, commonly bend the tree to one side, but are extended to a great length, and in so delicate and pleasant order, as if they were trimmed and made even with great diligence, by which they are easily distinguished, at a great distance, from fir-trees. The leaves (continues he) are very like to those of the larch-tree, growing close together in little branches upon small brown shoots.

Maundrel, in his Travels, says, there were but 16 large trees remaining when he visited the mountain, some of which were of a prodigious bulk, but that there were many more young ones of a smaller size: he measured one of the largest, and found it to be 12 yards six inches in girth, and yet sound, and 37 yards in the spread of its boughs. At about five or six yards from the ground it was divided into five limbs, each of which was equal to a great tree. What Maundrel hath related was confirmed by a gentleman who was there in the year 172[illegible], with this difference only, viz. in the dimensions of the branches of the largest tree, which he measured, and found to be 22 yards diameter. Now, whether Mr Maundrel meant 37 yards in circumference of the spreading branches, or the diameter of them, cannot be determined by his words; yet either of them well agrees with this last account.

12. There is another species, viz. the *larch tree*, which the old botanists ranked under larix, with deciduous leaves, and oval obtuse cones. It grows naturally upon the Alps and Apennines, and of late has been very much propagated in Britain. It is of quick growth, and the trunk rises to 50 feet or more; the branches are slender, their ends are generally hanging downward, and are garnished with long narrow leaves which arise in clusters from one point, spreading open above like the hairs of a painter's brush: they are of a light green, and fall away in autumn. In the month of April the male flowers appear, which are disposed in form of small cones; the female flowers are collected into oval obtuse cones, which in some species have bright purple tops, and in others they are white: these differences are accidental; the cones are about an inch long, obtuse at their points; the scales are smooth, and lie over each other: under each scale there are generally lodged two seeds, which have wings. There are other two varieties of this tree, one of which is a native of America, and the other of Siberia. The cones of the American kind which have been brought to Britain seem in general to be larger than those of the common sort.

"Many encomiums (says Hanbury when speaking of this species) have been bestowed on the timber of the larch: and we find such a favourable account of it in ancient authors, as should induce us to think it would be proper for almost any use. Evelyn recites a story of Witsen, a Dutch writer, that a ship built of this timber and cypress had been found in the Numidian sea, twelve fathoms under water, sound and entire, and reduced to such a hardness as to resist the sharpest tool, after it had lain submerged above 1400 years. Certain it is this is an excellent wood for ship and house-building. At Venice this wood is frequently used in building their houses, as well as in Switzerland, where these trees abound: so that, without all doubt, the larch excels for masts for ships, or beams for houses, doors, windows, &c. particularly as it is said to resist the worm.

"In Switzerland (A) their houses are covered with boards of this wood cut out a foot square; and, as it emits a resinous substance, it so diffuses itself into every joint and crevice, and becomes so compact and close, as well as so hardened by the air, as to render the covering proof against all weather. But as such covering for houses would cause great devastation in case of fire, the buildings

(A) "Between Bex and Bevieux (says Coxe in his *Travels in Switzerland*), I observed the larch in great plenty. Painters, from the time of Pliny to that of Raphael, trusted their works to this wood, which the Roman naturalist stiles *immortale lignum*. The wood is reckoned excellent for all works which are to lie under water: and the borderers on the lake of Geneva prefer it for building their vessels. In these parts I saw most beautiful woods of chesnut. Haller says that they extend some leagues: he also informs us, that they are found in other parts of Switzerland, and even in desert places in some of the transalpine parts. Accident must have brought them thither, as it appears from Pliny that these trees were first introduced into Europe from Sardis."

buildings are confined to a limited diftance by an order of police from the magiftrates. The wood, when firft laid on the houfes, is faid to be very white; but this colour, in two or three years is changed, by means of the fun and refin, to a black, which appears like a fmooth fhining varnifh."

Of the common larch there are feveral varieties. The flowers which the commoneft fort exhibits early in the fpring are of a delicate red colour; another fort produces white flowers at the fame feafon, and thefe have a delightful effect among thofe of the red fort; whilft another, called the *Black Newfoundland larix*, increafes the variety, though by an afpect little differing from the others. There are alfo larches with greenifh flowers, pale red, &c. all of which are accidental varieties from feeds. Thefe varieties are eafily diftinguifhed, even when out of blow: the young fhoots of the white-flowering larch are of the lighteft green, and the cones when ripe are nearly white. The red flowering larch has its fhoots of a reddifh caft, and the cones are of a brown colour; whilft the cones and fhoots of the black Newfoundland larch are in the fame manner proportionally tinged. The cones, which are a very great ornament to feveral forts of the pines, are very little to thefe. Their chief beauty confifts in the manner of their growth, the nature and beauty of their pencilled leaves and fair flowers; for the cones that fucceed them are fmall, of a whitifh, a reddifh, or a blackifh-brown colour, and make no figure.

The pinus cedrus and pinus larix are propagated by fowing in March on a bed of light earth expofed to the morning fun. The feed muft be covered half an inch thick with fine light earth, and the beds watered at times when the weather is dry. In about fix weeks the plants will appear; they muft at this time be carefully guarded from the birds, fhaded from the fun and winds, and kept very clear of weeds. In the latter end of April the following year, they may be removed into beds of frefh earth, placing them at ten inches diftance every way. They are to be kept here two years, and fuch of them as feem to bend muft be tied up to a ftake to keep them upright. They may afterwards be planted in the places where they are to remain. They thrive well on the fides of barren hills, and make a very pretty figure there.

Refpecting the ufes of this tree, Dr Pallas, in his *Flora Roffica*, informs us, that if it is burnt, and the wood confumed, the internal part of the wood diftils copioufly a drying reddifh gum, a little lefs glutinous than gum arabic, fomewhat of a refinous tafte, but wholly foluble in water. At the inftigation of M. Kinder, this gum has lately been fold in the Ruffian fhops under the name of *gummi Orenburgenfis*, but which our author thinks fhould be called *gummi Uralienfe* or *laricis*. It is eaten by the Woguli as a dainty, and is faid to be nutritious and antifcorbutic. Some manna was gathered from the green leaves, but it could never be condenfed. The Ruffians ufe the boletus laricinus as an emetic in intermittents, and to check the leucorrhœa. At Bafchir and Siberia the inhabitants fprinkle the dry powder on the wounds of oxen and horfes, as a detergent and anthelmintic. The nuts of the pinus cembra, the fame author afferts, are eaten as luxuries in Ruffia, and are even exported with the fame view. The unripe cones give a very fragrant oil, termed balfamic. The inhabitants of Siberia ufe the tender tops, and even the bark rubbed off in the fpring, as an antifcorbutic. The kernels of the nuts of the amygdalus nana give a very pleafing flavour to brandy; and, when preffed, afford a bitter oil in large quantities. The way of deftroying the bitter is by digefting it in the fun with fpirit of wine, and it then becomes fweet and extremely agreeable.

From the larch-tree is extracted what is erroneoufly called *Venice turpentine*. This fubftance, or natural balfam, flows at firft without incifion; when it has done dropping, the poor people who wait in the fir woods make incifions at about two or three feet from the ground into the trunks of the trees, into which they fix narrow troughs about 20 inches long. The end of thefe troughs is hollowed like a ladle; and in the middle is a fmall hole bored for the turpentine to run into the receiver which is placed below it. As the gummy fubftance runs from the trees, it paffes along the floping gutter or trough to the ladle, and from thence runs through the holes into the receiver. The people who gather it vifit the trees morning and evening from the end of May to September, to collect the turpentine out of the receivers. When it flows out of the tree, Venice turpentine is clear like water, and of a yellowifh white; but as it grows older, it thickens and becomes of a citron colour. It is procured in the greateft abundance in the neighbourhood of Lyons, and in the valley of St Martin near St Lucern in Switzerland.

Though we have already noticed the manner of cultivating fome of the particular fpecies of this genus, and have alfo remarked the ufes of fome of them, we fhall finifh the article with a few general obfervations on the culture and ufes of the whole.

Culture. All the forts of pines are propagated by feeds produced in hard woody cones. The way to get the feeds out of thefe cones is to lay them before a gentle fire, which will caufe the cells to open, and then the feeds may be eafily taken out. If the cones are kept entire, the feeds will remain good for fome years; fo that the fureft way of preferving them is to let them remain in the cones till the time for fowing the feeds. If the cones are kept in a warm place in fummer, they will open and emit the feeds; but if they are not expofed to the heat, they will remain clofe for a long time. The beft feafon for fowing the pines is about the end of March. When the feeds are fown, the place fhould be covered with nets to keep off the birds; otherwife, when the plants begin to appear with the hufk of the feed on the top of them, the birds will peck off the tops, and thus deftroy them.

Ufes. From the firft fpecies is extracted the common turpentine, much ufed by farriers, and from which is drawn the oil of that name. The procefs of making pitch, tar, refin, and turpentine, from thefe trees is very familiar. In the fpring time, when the fap is moft free in running, they pare off the bark of the pine tree, to make the fap run down into a hole which they cut at the bottom to receive it. In the way, as it runs down, it leaves a white matter like cream, but a little thicker. This is very different from all the kinds of refin and turpentine in ufe, and it is generally fold to be ufed in the making of flambeaux inftead of white bees wax. The matter that is received in the hole at the bottom is taken up with ladles, and put in a large bafket. A great part of this immediately runs through, and this is the com-

mon

Pinus. mon turpentine. This is received into ſtone or earthen pots, and is ready for ſale. The thicker matter, which remains in the baſket, they put into a common alembic, adding a large quantity of water. They diſtil this as long as any oil is ſeen ſwimming upon the water. This oil they ſeparate from the ſurface in large quantities, and this is the common oil or ſpirit of turpentine. The remaining matter at the bottom of the ſtill is common yellow reſin. When they have thus obtained all that they can from the ſap of the tree, they cut it down, and hewing the wood into billets, they fill a pit dug in the earth with theſe billets, and ſetting them on fire, there runs from them, while they are burning, a black thick matter. This naturally falls to the bottom of the pit, and this is the tar. The top of the pit is covered with tiles, to keep in the heat; and there is at the bottom a little hole, out at which the tar runs like oil. If this hole be made too large, it ſets the whole quantity of the tar on fire; but, if ſmall enough, it runs quietly out.

The tar, being thus made, is put up in barrels; and if it be to be made into pitch, they put it into large boiling veſſels, without adding any thing to it. It is then ſuffered to boil a while, and being then let out, is found when cold to be what we call pitch.

A decoction of the nuts or ſeeds of the firſt ſpecies in milk, or of the extremities of the branches pulled in ſpring, is ſaid, with a proper regimen, to cure the moſt inveterate ſcurvy. The wood of this ſpecies is not valued; but that of the Scots pine is ſuperior to any of the reſt. It is obſervable of the Scots pine, that when planted in bogs, or in a moiſt ſoil, though the plants make great progreſs, yet the wood is white, ſoft, and little eſteemed; but when planted in a dry ſoil, though the growth of the trees is there very ſlow, yet the wood is proportionably better. Few trees have been applied to more uſes than this. The talleſt and ſtraighteſt are formed by nature for maſts to our navy. The timber is reſinous, durable, and applicable to numberleſs domeſtic purpoſes, ſuch as flooring and wainſcotting of rooms, making of beds, cheſts, tables, boxes, &c. From the trunk and branches of this, as well as moſt others of the pine tribe, tar and pitch is obtained. By inciſion, barras, Burgundy pitch, and turpentine, are acquired and prepared. The reſinous roots are dug out of the ground in many parts of the Highlands, and, being divided into ſmall ſplinters, are uſed by the inhabitants to burn, inſtead of candles.—At Loch-Broom, in Roſs-ſhire, the fiſhermen make ropes of the inner bark; but hard neceſſity has taught the inhabitants of Sweden, Lapland, and Kamtſchatka, to convert the ſame into bread. To effect this, they, in the ſpring ſeaſon, make choice of the talleſt and faireſt trees; then ſtripping off carefully the outer bark, they collect the ſoft, white, ſucculent interior bark, and dry it in the ſhade. When they have occaſion to uſe it, they firſt toaſt it at the fire, then grind, and after ſteeping the flour in warm water to take off the reſinous taſte, they make it into thin cakes, which are baked for uſe. On this ſtrange food the poor inhabitants are ſometimes conſtrained to live for a whole year; and, we are told, through cuſtom, become at laſt even fond of it. Linnæus remarks, that this ſame bark-bread will fatten ſwine; and humanity obliges us to wiſh, that men might never be reduced to the neceſſity of robbing them of ſuch a food. The interior bark, of which the above-mentioned bread is made, the Swediſh boys frequently peel off the trees in the ſpring, and eat raw with greedy appetite. From the cones of this tree is prepared a diuretic oil, like the oil of turpentine, and a reſinous extract, which has ſimilar virtues with the balſam of Peru. An infuſion or tea of the buds is highly commended as an antiſcorbutic. The farina, or yellow powder, of the male-flowers, is ſometimes in the ſpring carried away by the winds, in ſuch quantities, where the trees abound, as to alarm the ignorant with the notion of its raining brimſtone. The tree lives to a great age: Linnæus affirms to 400 years. Pinus ‖ Pipe.

PIONEERS, in the art of war, are ſuch as are commanded in from the country, to march with an army for mending the ways, for working on intrenchments and fortifications, and for making mines and approaches. The ſoldiers are likewiſe employed for all theſe purpoſes. Moſt of the foreign regiments of artillery have half a company of pioneers, well inſtructed in that important branch of duty. Our regiments of infantry and cavalry have three or four pioneers each, provided with aprons, hatchets, ſaws, ſpades, and pickaxes. Each pioneer muſt have an axe, a ſaw, and an apron; a cap with a leather crown, and a black bearſkin front, on which is to be the king's creſt in white, on a red ground; and the number of the regiment is to be on the back part of it.

PIP, or PEP, a diſeaſe among poultry, conſiſting of a white thin ſkin, or film, that grows under the tip of the tongue, and hinders their feeding. It uſually ariſes from want of water, or from the drinking puddle-water, or eating filthy meat. It is cured by pulling off the film with the fingers, and rubbing the tongue with ſalt. Hawks are particularly liable to this diſeaſe, eſpecially from feeding on ſtinking fleſh.

PIPE, in building, &c. a canal, or conduit, for the conveyance of water and other liquids. Pipes for water, water-engines, &c. are uſually of lead, iron, earth, or wood: the latter are uſually made of oak or elder. Thoſe of iron are caſt in forges; their uſual length is about two feet and a half: ſeveral of theſe are commonly faſtened together by means of four ſcrews at each end, with leather or old hat between them, to ſtop the water. Thoſe of earth are made by the potters; theſe are fitted into one another, one end being always made wider than the other. To join them the cloſer, and prevent their breaking, they are covered with tow and pitch: their length is uſually about that of the iron pipes. The wooden pipes are trees bored with large iron augres, of different ſizes, beginning with a leſs, and then proceeding with a larger ſucceſſively; the firſt being pointed, the reſt being formed like ſpoons, increaſing in diameter, from one to ſix inches and more: they are fitted into the extremities of each other (as repreſented fig. 2.), and are ſold by the foot. Plate CCCCXIX. fig. 2.

Wooden pipes are bored as follows. The machine repreſented fig. 1. is put in motion by the wheel A, Fig. 1. which is moved by a current of water; upon the axle of this wheel is a cog-wheel B, which cauſes the lanterns C, D, to turn horizontally, whoſe common axis is conſequently in a perpendicular direction. The lantern D turns at the ſame time two cog-wheels, E and F: the firſt, E, which is vertical, turns the augre which bores the wood; and the ſecond F, which is horizontal, cauſes the carriage bearing the piece to advance by means of the arms H, I, which take hold of the notches

ches in the wheel K. The firſt, H, by means of the notches, draws the wheel towards F; and the other, I, puſhes the under-poſt of the wheel in an oppoſite direction; both which motions tend to draw the carriage towards F, and conſequently cauſe the augre to pierce the wood. The augre being from 9 to 12 feet in length, and of a proportionable bigneſs, it will be neceſſary to have two pieces, as L, L, to ſupport its weight, and cauſe it to enter the piece to be bored with the ſame uniformity.

For the conſtruction of leaden pipes, ſee the article PLUMBERY.

Air-PIPES. See *AIR-Pipes*.

PIPES of an Organ. See ORGAN.

Bag-PIPE. See *BAG-Pipe*.

Horn-PIPE. See HORNPIPE.

Tobacco-PIPE, a machine uſed in the ſmoking of tobacco, conſiſting of a long tube, made of earth or clay, having at one end a little caſe, or furnace, called the *bowl*, for the reception of the tobacco, the fumes whereof are drawn by the mouth through the other end. Tobacco pipes are made of various faſhions; long, ſhort, plain, worked, white, varniſhed, unvarniſhed, and of various colours, &c. The Turks uſe pipes three or four feet long, made of ruſhes, or of wood bored, at the end whereof they fix a kind of a pot of baked earth, which ſerves as a bowl, and which they take off after ſmoking.

PIPE, alſo denotes a veſſel or meaſure for wine, and things meaſured by wine meaſure. See BARREL and MEASURE.

PIPE, in *Mining*, is where the ore runs forwards endwiſe in a hole, and doth not ſink downwards or in a vein.

PIPE, *Pipa*, in *Law*, is a roll in the exchequer, called alſo the *great roll*. See the next article.

PIPE-Office, is an office wherein a perſon called the *clerk of the pipe*, makes out leaſes of crown-lands, by warrant from the lord-treaſurer, or commiſſioners of the treaſury, or chancellor of the exchequer. The clerk of the pipe makes out alſo all accounts of ſheriffs, &c. and gives the accountants their *quietus eſt*. To this office are brought all accounts which paſs the remembrancer's office, and remain there, that if any ſtated debt be due from any perſon, the ſame may be drawn down into the great roll of the pipe: upon which the comptroller iſſues out a writ, called the *ſummons of the pipe*, for recovery thereof; and if there be no goods or chattels, the clerk then draws down the debts to the lord treaſurer's remembrancer, to write eſtreats againſt their lands. All tallies which vouch the payment of any ſum contained in ſuch accounts are examined and allowed by the chief ſecondary of the pipe. Beſides the chief clerk in this office, there are eight attorneys or ſworn clerks, and a comptroller.

PIPE-Fiſh. See SYNGNATHUS, ICHTHYOLOGY *Index*.

Sea PIPES, the trivial name of univalve ſhells belonging to the genus *dentalis*. See CONCHOLOGY *Index*.

PIPER, a ſpecies of fiſh. See TRIGLA, ICHTHYOLOGY *Index*.

PIPER, *Pepper*; a genus of plants belonging to the diandria claſs. See BOTANY *Index*. There are 20 ſpecies, of which the moſt remarkable is the ſiriboa, with oval, heart-ſhaped, nerved leaves, and reflexed ſpikes. This is the plant which produces the pepper ſo much uſed in food. It is a ſhrub whoſe root is ſmall, fibrous, and flexible; it riſes into a ſtem, which requires a tree or prop to ſupport it. Its wood has the ſame ſort of knots as the vine; and when it is dry, it exactly reſembles the vine-branch. The leaves, which have a ſtrong ſmell and a pungent taſte, are of an oval ſhape; but they diminiſh towards the extremity, and terminate in a point. From the flower-buds, which are white, and are ſometimes placed in the middle and ſometimes at the extremity of the branches, are produced ſmall berries reſembling thoſe of the currant tree. Each of theſe contains between 20 and 30 corns of pepper; they are commonly gathered in October, and expoſed to the ſun ſeven or eight days. The fruit which was green at firſt, and afterwards red, when ſtripped of its covering aſſumes the appearance it has when we ſee it. The largeſt, heavieſt, and leaſt ſhrivelled, is the beſt.

The pepper plant flouriſhes in the iſlands of Java, Sumatra (A), and Ceylon, and more particularly on the Malabar coaſt. It is not ſown, but planted; and great nicety is required in the choice of the ſhoots. It produces no fruit till the end of three years; but bears ſo plentifully the three ſucceeding years, that ſome plants yield between ſix and ſeven pounds of pepper. The bark then begins to ſhrink; and the ſhrub declines ſo faſt, that in 12 years time it ceaſes bearing.

The culture of pepper is not difficult: it is ſufficient to plant it in a rich ſoil, and carefully to pull up the weeds that grow in great abundance round its roots, eſpecially the three firſt years. As the ſun is highly neceſſary to the growth of the pepper plant, when it is ready to bear, the trees that ſupport it muſt be lopped to prevent their ſhade from injuring the fruit. When the ſeaſon is over, it is proper to crop the head of the plant. Without this precaution, there would be too much wood, and little fruit.

The pepper exported from Malabar, which was formerly entirely in the hands of the Portugueſe, and was afterwards divided between the Dutch, Britiſh, and French, amounted to about 10,000,000 weight. Betel, or betle, is a ſpecies of this genus. See BETEL. It is a creeping and climbing plant like the ivy; and its leaves a good deal reſemble thoſe of the citron, though they are longer and narrower at the extremity. It grows in all parts of India, but thrives beſt in moiſt places. The natives cultivate it as we do the vine, placing props for it to run and climb upon; and it is a common practice to plant it againſt the tree which bears the areca-nut.

At all times of the day, and even in the night, the Indians chew the leaves of the betel, the bitterneſs of which is corrected by the areca that is wrapped up in them. There is conſtantly mixed with it the chinam, a

(A) See a copious account of the mode of cultivating pepper in Sumatra, in Mr Marſden's *Hiſtory of Sumatra*, or in the *New Annual Regiſter* for 1783, p. 147.

Piper ‖ Piquet.

a kind of burnt lime made of shells. The rich frequently add perfumes, either to gratify their vanity or their sensuality.

It would be thought a breach of politeness among the Indians to take leave for any long time, without presenting each other with a purse of betel. It is a pledge of friendship that relieves the pain of absence. No one dares to speak to a superior unless his mouth is perfumed with betel; it would even be rude to neglect this precaution with an equal. The women of gallantry are the most lavish in the use of betel, as being a powerful incentive to love. Betel is taken after meals; it is chewed during a visit; it is offered when you meet, and when you separate; in short, nothing is to be done without betel. If it is prejudicial to the teeth, it assists and strengthens the stomach. At least, it is a general fashion that prevails throughout India.

London Medical Journal, vol. viii. part iii. p. 276, &c.

The *piper amalago*, or black pepper, and the *piper inequale*, or long pepper of Jamaica, with some other species, are indigenous, and known by the names of *joint wood*, or *peppery elders*. The first bears a small spike, on which are attached a number of small seeds of the size of mustard. The whole of the plant has the exact taste of the East India black pepper. The long pepper bush grows taller than the amalago. The leaves are broad, smooth, and shining. The fruit is similar to the long pepper of the shops, but smaller. The common people in Jamaica season their messes with the black pepper. To preserve both, the fruit may be slightly scalded when green, then dried, and wrapped in paper. Perhaps hereafter they may be deemed worthy of attention.

PIPRA, a genus of birds, of the order of *passeres*. See ORNITHOLOGY *Index*.

PIQUET, or PICKET, a celebrated game at cards, much in use throughout the polite world.

It is played between two persons, with only 32 cards; all the deuces, threes, fours, fives, and sixes, being set aside.

In reckoning at this game, every card goes for the number it bears, as a ten for ten; only all court cards go for ten, and the ace for eleven: and the usual game is one hundred up. In playing, the ace wins the king, the king the queen, and so down.

Twelve cards are dealt round, usually by two and two; which done, the remainder are laid in the middle: if one of the gamesters finds he has not a court card in his hand, he is to declare he has *carte-blanche*, and tell how many cards he will lay out, and desire the other to discard, that he may show his game, and satisfy his antagonist that the carte-blanche is real; for which he reckons ten.

Each person discards, i. e. lays aside a certain number of his cards, and takes in a like number from the stock. The first of the eight cards may take three, four, or five; the dealer all the remainder, if he pleases.

After discarding, the eldest hand examines what suit he has most cards of; and reckoning how many points he has in that suit, if the other have not so many in that or any other suit, he tells one for every ten of that suit. He who thus reckons most is said to win the point.

The point being over, each examines what *sequences* he has of the same suit, viz. how many tierces, or sequences of threes, quartes or fours, quintes or fives, sixiemes, or sixes, &c. For a tierce they reckon three points, for a quarte four, for a quinte 15, for a sixieme 16, &c. And the several sequences are distinguished in dignity by the cards they begin from: thus ace, king, and queen, are called *tierce major*; king, queen, and knave, *tierce to a king*; knave, ten, and nine, *tierce to a knave*, &c. and the best tierce, quarte, or quinte, i. e. that which takes its descent from the best card, prevails, so as to make all the others in that hand good, and destroy all those in the other hand. In like manner, a quarte in one hand sets aside a tierce in the other.

Piquet.

The sequences over, they proceed to examine how many aces, kings, queens, knaves, and tens, each holds; reckoning for every three of any sort, three: but here too, as in sequences, he that with the same number of threes has one that is higher than any the other has, e. gr. three aces, has all his others made good hereby, and his adversary's all set aside. But four of any sort, which is called a *quatorze*, always sets aside three.

All the game in hand being thus reckoned, the eldest proceeds to play, reckoning one for every card he plays above a nine, and the other follows him in the suit; and the highest card of the suit wins the trick. Note, unless a trick be won with a card above a nine (except the last trick), nothing is reckoned for it, though the trick serves afterwards towards winning the cards; and that he who plays last does not reckon for his cards unless he wins the trick.

The cards being played out, he that has most tricks reckons ten for winning the cards. If they have tricks alike, neither reckons any thing. The deal being finished, and each having marked up his game, they proceed to deal again as before, cutting afresh each time for the deal.

If both parties be within a few points of being up, the carte-blanche is the first thing that reckons, then the point, then the sequences, then the quatorzes or threes, then the tenth cards.

He that can reckon 30 in hand by carte-blanche, points, quintes, &c. without playing, before the other has reckoned any thing, reckons 90 for them; and this is called a *repique*. If he reckons above 30, he reckons so many above 90. If he can make up 30, part in hand and part play, ere the other has told any thing, he reckons for them 60. And this is called a *pique*. Whence the name of the game. He that wins all the tricks, instead of ten, which is his right for winning the cards, reckons 40. And this is called a *capot*.

Mr de Moivre, who has made this game the object of mathematical investigation, has proposed and solved the following problems: 1. To find at piquet the probability which the dealer has for taking one ace or more in three cards, he having none in his hand. He concludes from his computation, that it is 29 to 28 that the dealer takes one ace or more. 2. To find at piquet the probability which the eldest has of taking an ace or more in five cards, he having no ace in his hand. Answer: 232 to 91, or 5 to 2, nearly. 3. To find at piquet the probability which the eldest hand has of taking an ace and a king in five cards, he having none in his hand. Answer: the odds against the eldest hand taking

taking an ace and a king are 331 to 315, or 21 to 20 nearly. 4. To find at piquet the probability of having 12 cards dealt to, without king, queen, or knaves, which caſe is commonly called *cartes-blanches*. Anſwer; the odds againſt cartes-blanches are 1791 to 1 nearly. 5. To find how many different ſets, eſſentially different from one another, one may have at piquet before taking in. Anſwer; 28,967,278. This number falls ſhort of the ſum of all the diſtinct combinations, whereby 12 cards may be taken out of 32, this number being 225,792,840; but it muſt be conſidered that in that number ſeveral ſets of the ſame import, but differing in ſuit, might be taken, which would not introduce an eſſential difference among the ſets. The ſame author gives alſo ſome obſervations on this game, which he had from an experienced player. See *Doctrine of Chances*, p. 179, &c. M. de Monmort has treated of piquet in his *Analyſe des Jeux de Hazard*, p. 162.

PIRA, is a name by which a variety of foreign fiſhes are diſtinguiſhed. The *pira aca* is a little horned fiſh of the Weſt Indies, called by Cluſius and others the *monoceros* or *unicorn-fiſh*. The *pira acangata* is the name of a Braſilian fiſh, which reſembles the perch both in ſize and ſhape. It ſeldom exceeds four or five inches in length; its mouth is ſmall; its tail forked. On the back it has only one long fin, which is ſupported by rigid and prickly ſpines. This fin it can depreſs at pleaſure, and ſink within a cavity made for it in the back. Its ſcales are of a ſilvery white colour; it is wholeſome and well taſted. *Pira bebe* is the name of the milvus, or kite-fiſh. *Pira coaba* is an American fiſh of the truttaceous kind, of a very delicate flavour. It grows to the length of 12 inches; its noſe is pointed, and its mouth large, but without teeth; the upper jaw is longer than the under one, and hangs over like a cartilaginous prominence; its eyes are very large, and its tail is forked; under each of the gill fins there is a beard made of ſix white filaments, and covered with ſilvery ſcales. *Pira jurumenbeca* is a Braſilian fiſh, otherwiſe called *bocca molle*. It lives in the muddy bottom of the American ſeas, and is a long-bodied not flatted fiſh. It grows to a great ſize, being found nine, and ſometimes even ten or eleven, feet long, and two feet and a half thick. It has one long fin on the back, the anterior part of which is thin and pellucid. There is alſo a cavity on the back, as in the pira acangata, into which the fin can be depreſſed at pleaſure; the tail is not forked, and the ſcales are all of a ſilvery colour and brightneſs. The fiſh is very well taſted; the *pira pixanga* is another Braſilian fiſh of the turdus or wraſſe kind, and called by ſome the *gutviſch*. It is generally about four or five inches long; its mouth is pretty large, and furniſhed with very ſmall and very ſharp teeth; its head is ſmall, but its eyes are large and prominent, the pupil being of a fine turquoiſe colour, and the iris yellow and red in a variety of ſhades. The coverings of the gills end in a triangular figure, and are terminated by a ſhort ſpine or prickle; its ſcales are very ſmall, and ſo evenly arranged, and cloſely laid on the fleſh, that it is very ſmooth to the touch; its tail is rounded at the end; its whole body, head, tail, and fins, are of a pale yellow colour, variegated all over with very beautiful blood-coloured ſpots; theſe are round, and of the bigneſs of hemp-ſeed on the back and ſides, and ſomething larger on the belly; the fins are all ſpotted in the ſame manner, and are all marked with an edge of red. It is caught among the rocks, and about the ſhores, and is a very well taſted fiſh. *Piranha* is an American fiſh, more generally known by the name *piraya*. *Piraquiba*, or *ipiraquiba*, is the name of a fiſh originally Braſilian, which ſome writers apply to the *remora* or *ſucking fiſh*.

PIRÆUS PORTUS, in *Ancient Geography*, a celebrated port to the weſt of Athens, conſiſting naturally of three harbours or baſons, (Thucydides); which lay neglected, till Themiſtocles put the Athenians on making it a commodious port, (Nepos); the Phalerus, a ſmall port, and not far from the city, being what they uſed before that time, (Pauſanias, Nepos). Piræus was originally a village of Attica, (Pauſanias); an iſland (Strabo); and though diſtant 40 ſtadia from Athens, was joined to it by two long walls, (Thucydides), and itſelf locked or walled round, (Nepos): A very commodious and ſafe harbour. The whole of its compaſs was 60 ſtadia, including the Munichia. Not far from the Piræus ſtood the ſepulchre of Themiſtocles; whither his friends conveyed his bones from Magneſia, into the Hither Aſia, (Cicero, Plutarch, Pauſanias). The entrance of the Piræus is narrow, and formed by two rocky points, one belonging to the promontory of Eetion, the other to that of Alcimus. Within were three ſtations for ſhipping; Kantharus, ſo named from a hero; Aphrodiſium, from a temple of Venus; and Zea, the reſort of veſſels laden with grain. By it was a demos or borough town of the ſame name before the time of Themiſtocles, who recommended the exchanging its triple harbour for the ſingle one of Phalerum, both as more capacious and as better ſituated for navigators. The wall was begun by him when archon, in the ſecond year of the 75th Olympiad, 477 years before Chriſt; and afterwards he urged the Athenians to complete it as the importance of the place deſerved. This whole fortification was of hewn ſtone, without cement or other material, except lead and iron, which were uſed to hold together the exterior ranges or facings. It was ſo wide that loaded carts could paſs on it in different directions, and it was 40 cubits high, which was about half what he had deſigned.

Chandler's Travels in Greece, p. 19, &c.

The Piræus, as Athens flouriſhed, became the common emporium of all Greece. Hippodamus an architect, celebrated, beſides other monuments of his genius, as the inventor of many improvements in houſe-building, was employed to lay out the ground. Five porticoes, which uniting formed the *Long Portico*, were erected by the ports. Here was an *agora*, or market-place, and farther from the ſea, another called *Hippodamia*. By the veſſels were dwellings for the mariners. A theatre was opened, temples were raiſed, and the Piræus, which ſurpaſſed the city in utility, began to equal it in dignity. The cavities and windings of Municia, natural and artificial, were filled with houſes; and the whole ſettlement, comprehending Phalerum and the ports of the Piræus, with the arſenals, the ſtorehouſes, the famous armoury of which Philo was the architect, and the ſheds for 300, and afterwards 400, triremes, reſembled the city of Rhodes, which had been planned by the ſame Hippodamus. The ports, on the commencement of the

Piræus, Piracy.

Peloponneſian war, were ſecured with chains. Centinels were ſtationed, and the Piræus was carefully guarded.

The Piræus was reduced with great difficulty by Sylla, who demoliſhed the walls, and ſet fire to the armoury and arſenals. In the civil war it was in a defenceleſs condition. Calenus, lieutenant to Cæſar, ſeized it, inveſted Athens, and ravaged the territory. Strabo, who lived under the emperors Auguſtus and Tiberius, obſerves, that the many wars had deſtroyed the long walls, with the fortreſs of Munychia, and had contracted the Piræus into a ſmall ſettlement by the ports and the temple of Jupiter Saviour. This fabric was then adorned with wonderful pictures, the works of illuſtrious artiſts, and on the outſide with ſtatues. In the ſecond century, beſides houſes for triremes, the temple of Jupiter and Minerva remained, with their images in braſs, and a temple of Venus, a portico, and the tomb of Themiſtocles.

The port of the Piræus has been named *Porto Lione*, from the marble lion ſeen in the chart, and alſo *Porto Dracco*. The lion has been deſcribed as a piece of admirable ſculpture, 10 feet high, and as repoſing on its hinder parts. It was pierced, and, as ſome have conjectured, had belonged to a fountain. Near Athens, in the way to Eleuſis, was another, the poſture couchant; probably its companion. Both theſe were removed to Venice by the famous general Moroſini, and are to be ſeen there before the arſenal. At the mouth of the port are two ruined piers. A few veſſels, moſtly ſmall craft, frequent it. Some low land at the head ſeems an incroachment on the water. The buildings are a mean cuſtomhouſe, with a few ſheds; and by the ſhore on the eaſt ſide, a warehouſe belonging to the French, and a Greek monaſtery dedicated to St Spiridion. On the oppoſite ſide is a rocky ridge, on which are remnants of the ancient wall, and of a gateway towards Athens. By the water edge are veſtiges of building; and going from the cuſtomhouſe to the city on the right hand, traces of a ſmall theatre in the ſide of the hill of Munychia.

PIRACY, the crime of robbery and depredation upon the high ſeas.

By the ancient common law, piracy, if committed by a ſubject, was held to be a ſpecies of treaſon, being contrary to his natural allegiance; and by an alien, to be felony only: but now, ſince the ſtatute of treaſons, 25 Edw. III. c. 2. it is held to be only felony in a ſubject. Formerly it was only cognizable by the admiralty courts, which proceed by the rules of the civil law. But, it being inconſiſtent with the liberties of the nation, that any man's life ſhould be taken away, unleſs by the judgment of his peers, or the common law of the land, the ſtatute 28 Hen. VIII. c. 15. eſtabliſhed a new juriſdiction for this purpoſe; which proceeds according to the courſe of the common law.

The offence of piracy, by common law, conſiſts in committing thoſe acts of robbery and depredation upon the high ſeas, which, if committed upon land, would have amounted to felony there. But, by ſtatute, ſome other offences are made piracy alſo: as, by ſtatute 11 and 12 W. III. c. 7. if any natural-born ſubject commits any act of hoſtility upon the high ſeas, againſt others of his majeſty's ſubjects, under colour of a commiſſion from any foreign power; this, though it would only be an act of war in an alien, ſhall be conſtrued piracy in a ſubject. And farther, any commander, or other ſeafaring perſon, betraying his truſt, and running away with any ſhip, boat, ordnance, ammunition, or goods; or yielding them up voluntarily to a pirate; or conſpiring to do theſe acts; or any perſon aſſaulting the commander of a veſſel, to hinder him from fighting in defence of his ſhip; or confining him, or cauſing or endeavouring to cauſe a revolt on board; ſhall, for each of theſe offences, be adjudged a pirate, felon, and robber, and ſhall ſuffer death, whether he be principal, or merely acceſſory by ſetting forth ſuch pirates, or abetting them before the fact, or receiving or concealing them or their goods after it. And the ſtatute 4 Geo. I. c. 11. expreſsly excludes the principals from the benefit of clergy. By the ſtatute 8 Geo. I. c. 24. the trading with known pirates, or furniſhing them with ammunition, or fitting out any veſſel for that purpoſe, or in anywiſe conſulting, combining, confederating, or correſponding with them; or the forcibly boarding any merchant veſſel, though without ſeizing or carrying her off, and deſtroying or throwing any of the goods overboard; ſhall be deemed piracy: and ſuch acceſſories to piracy as are deſcribed by the ſtatute of King William are declared to be principal pirates; and all pirates convicted by virtue of this act are made felons without benefit of clergy. By the ſame ſtatutes alſo, (to encourage the defence of merchant-veſſels againſt pirates), the commanders or ſeamen wounded, and the widows of ſuch ſeamen as are ſlain, in any piratical engagement, ſhall be entitled to a bounty to be divided among them, not exceeding one-fiftieth part of the value of the cargo on board: and ſuch wounded ſeamen ſhall be entitled to the penſion of Greenwich hoſpital; which no other ſeamen are, except only ſuch as have ſerved in a ſhip of war. And if the commander ſhall behave cowardly, by not defending the ſhip, if ſhe carry guns or arms; or ſhall diſcharge the mariners from fighting, ſo that the ſhip falls into the hands of pirates; ſuch commander ſhall forfeit all his wages, and ſuffer ſix months impriſonment. Laſtly, by ſtatute 18 Geo. II. c. 30. any natural-born ſubject or denizen, who in time of war ſhall commit hoſtilities at ſea againſt any of his fellow-ſubjects, or ſhall aſſiſt an enemy on that element, is liable to be tried and convicted as a pirate.

Piracy, Pirate.

PIRATE, (πειρατης, Gr.); a ſea-robber, or an armed ſhip that roams the ſeas without any legal commiſſion, and ſeizes or plunders every veſſel ſhe meets indiſcriminately, whether friends or enemies.

The colours uſually diſplayed by pirates are ſaid to be a black field, with a death's head, a battle-axe, and hour-glaſs. The laſt inſtrument is generally ſuppoſed to determine the time allowed to the priſoners, whom they take, to conſider whether they will join the pirates in their felonious combination, or be put to death, which is often perpetrated in the moſt cruel manner.

Among the moſt celebrated pirates of the north is recorded Alvilda, daughter of a king of the Goths named *Syparaus*. She embraced this occupation to deliver herſelf from the violence impoſed on her inclination, by a marriage with Alf, ſon of Sigarus king of Denmark. She dreſſed herſelf as a man; and compoſed her band of rowers, and the reſt of her crew, of a number of young women attired in the ſame manner. Amongſt the firſt of her cruizes, ſhe touched at a place where a company

Pirate ‖ Piron.

of pirates bewailed the death of their captain. The ftrangers were captivated with the agreeable manners of Alvilda, and chofe her for their chief. By this reinforcement fhe became fo formidable upon the fea, that Prince Alf came to engage her. She fuftained his attacks for a confiderable time: but, in a vigorous action, Alf boarded her veffel, and having killed the greateft part of her crew, feized the captain, namely herfelf; whom neverthelefs he knew not, becaufe the princefs had a cafque which covered her vifage. Being mafter of her perfon, he removed the cafque; and in fpite of her difguife, inftantly recognized her, and offered her his hand in wedlock.

PIRENE, (Pliny); a fountain facred to the mufes, fpringing below the top of the Acrocorinthus, a high and fteep mountain which hangs over Corinth. Its waters were agreeable to drink, (Paufanias); extremely clear, (Strabo); very light, (Athenæus); and pale, (Perfius): having relation either to the grief of Pirene, mother of Cenchrea, from whofe tears this fountain arofe, (Paufanias); or to the palenefs brought on by the too eager purfuits of the mufes.

PIROMALLI, Paul, a dominican of Calabria, was fent a miffionary into the eaft. He remained a long time in Armenia, where he had the happinefs to bring back to the church many fchifmatics and Eutycheans, and the patriarch himfelf, who had before thrown every obftacle in his way. He afterwards paffed into Georgia and Perfia, then into Poland, in quality of Pope Urban VIII.'s nuncio, in order to appeafe the difturbances which had been occafioned there by the difputes of the Armenians, who were very numerous in that country. Piromalli united them in the profeffion of the fame faith, and obfervance of the fame ceremonies. In his return to Italy he was taken by fome corfairs, who carried him prifoner to Tunis. As foon as he was ranfomed he went to Rome, and gave an account of his miffion to the pope, who conferred upon him fome fignal marks of his efteem. His holinefs entrufted him with the revifal of an Armenian bible, and fent him again into the eaft, where he was promoted, in 1655, to the bifhopric of Naffivan. After having governed that church for nine years, he returned to Italy, and took the charge of the church of Baffignano, where he died three years after in 1667. His charity, his zeal, and other virtues, did honour to the epifcopal office. There are extant of his writings, 1. Some works of Controverfy and Theology. 2. Two Dictionaries; the one a Latin-Perfian, and the other an Armenian-Latin. 3. An Armenian Grammar. 4. A Directory, which is of great ufe in correcting Armenian books. All thefe works equally diftinguifh him for virtue and for learning.

PIRON, Alexis, a French poet, was born at Dijon in July 1689, where his father was an apothecary, and where he paffed more than 30 years in idle and deftructive diffipation. He was at length obliged to quit the place of his nativity, in order to avoid the reproaches of his fellow-citizens, on account of an ode which he had written, and which gave great offence. His relations not being able to give him much affiftance, he fupported himfelf at Paris by means of his pen, the ftrokes of which were as beautiful and fair as thofe of an engraver. He lived in the houfe of M. de Belleifle as his fecretary, and afterwards with a financier, who did not know that he had a man of genius under his roof. His reputation as a writer commenced with fome pieces which he publifhed for the entertainment of the populace, and which fhowed ftrong marks of original invention; but what fully eftablifhed his character in this way was his comedy intitled *Metromany*, which was the beft that had appeared in France fince Regnard's Gamefter. This performance, in five acts, well conducted, replete with genius, wit, and humour, was acted with the greateft fuccefs upon the French ftage in 1738. The author met with every attention in the capital which was due to a man of real genius, and whofe flafhes of wit were inexhauftible. We fhall infert a few anecdotes of him, which will ferve to fhow his character and turn of mind. In Burgundy the inhabitants of Beaune are called the *Affes of Beaune*. Piron often indulged his fatirical difpofition at their expence. One day as he was taking a walk in the neighbourhood of that city, he diverted himfelf with cutting down all the thiftles which he met with. When a friend afked him his reafon for doing fo, he replied, *J'ai à me plaindre des Beaunois; je leur coupe les vivres*, i. e. "I am forry indeed for the Beaunians; for I am cutting down their food." Being told again that thefe people would certainly be revenged of him,

> *Allez*, (fays he) *Allez: je ne crains point leur impuiffant courroux;*
> *Et quand je ferois feul, je les batterois tous.*

"Get you gone, get you gone: I fear not their feeble revenge; for though alone, I fhould beat them all." Going into a theatre one time where a play was acting, he afked what it was? The Cheats of Scapin, gravely replied a young Beaunian. "Ah! Sir, (fays Piron, after thanking him), I took it to be the Cheats of Oreftes." In the time of the play, fome body addreffes the company with "Silence there, gentlemen, we don't hear." "It is not at leaft (cried Piron) for want of ears." A bifhop one day afked Piron, during the difputes about Janfenifm, "Did you read my mandate, Mr Piron?" No, my lord; and you——The converfation turning very warm, the bifhop reminded him of the diftance which birth and rank had put between them. "Sir (fays Piron), I have plainly the fuperiority over you at this moment; for I am in the right, and you are in the wrong."—Voltaire's Semiramis did not meet with a very favourable reception the firft time it was acted. The author finding Piron behind the fcenes, afked him what he thought of his performance? "I think (replied he) you would have been pleafed that I had been the author of it." The performer of the character Ferdinand Cortez (the title of one of Piron's tragedies) having requefted fome corrections to be made on the play the firft time it was acted, Piron fired at the word *corrections*. The player, who was deputed to wait upon the author with this requeft, cited the example of Voltaire, who corrected fome of his pieces in order to gratify the tafte of the public. "The cafes are widely different (replied Piron); Voltaire works in chequer-work, and I caft in brafs." If this anfwer be not very modeft, we muft allow that it does not want wit. He thought himfelf, if not fuperior, at leaft equal to Voltaire. Some perfon congratulating him on having compofed the beft comedy of this age, he anfwered, with more franknefs than modefty, "Add too, and the beft tragedy."

gedy." The following verses are well known, in which he says:

En deux mots voulez-vous distinguer et connoitre
Le rimeur Dijonnois et le Parisien?
Le premier ne fut rien, et ne voulut rien etre;
L'autre voulut tout etre, et ne fut presque rien.

We see by these different traits that Piron had a sufficient stock of self-conceit. What helped to increase it, and make him fancy himself superior to the most celebrated of his contemporaries, was, that his company, on account of his original humour, of which he had an uncommon share, was more courted than that of Voltaire, who was otherwise too lively, too captious, and crabbed. But those who have favoured us with an account of his many witticisms in conversation, would have done more honour to his memory if they had passed over such as were either indecent or insipid. A thing often pleases over a glass of wine, which will not give the same satisfaction when it is repeated, especially if, in repeating it, you want to make it appear of some importance. Be that as it may, Piron's mischievous ingenuity was partly the cause which excluded him from the French Academy.—"I could not (said he) make thirty-nine people think as I do, and I could less think as thirty-nine do." He called that celebrated society very unjustly *les invalides du bel esprit*, "the invalids of wit;" and yet he often endeavoured to be one of those invalids. His death was hastened by a fall which he got a little before. He died the 21st of January 1773, at the age of 83. He had prepared for himself the following epitaph, in the way of an epigram:

Ci gît Piron, qui ne fut rien,
Pas même académicien.

"Here lies Piron, who was nothing, not even an academician."

His wife Maria Theresa Quenandon, who died in 1751, he describes as a sweet and most agreeable companion. They lived together for several years; and no husband ever discharged his duty with more fidelity and attention.

A collection of his works appeared in 1776, in 7 vols. 8vo, and 9 vols. 12mo. The principal pieces are, The School of Fathers; a comedy acted in 1728 under the title of Ungrateful Sons. Callisthenes; a tragedy, the subject of which is taken from Justin. The Mysterious Lover, a comedy. Gustavus and Ferdinand Cortez, two tragedies; some scenes of which discover an original genius, but the versification neither pleases the ear nor affects the heart. Metromany, a comedy. The Courses of Tempe, an ingenious pastoral, in which the manners both of the town and country are pleasantly drawn. Some odes, poems, fables, and epigrams. In this last kind of poetry he was very successful, and he may be placed after Marot and Rousseau. There was no occasion for loading the public with 7 vols. of his works; the half of that number might have sufficed. For, excepting Metromany, Gustavus, the Courses of Tempe, some odes, about 20 epigrams, three or four fables, and some epistles, the rest are but indifferent, and have no claim to any extraordinary merit.

PISA, a large town of Tuscany in Italy, situated on the river Arno, 52 miles from Florence. It was a famous republic, till subdued, first by the duke of Milan, and then by the Florentines in the year 1406. Before it lost its freedom, it is said to have contained near 150,000 inhabitants, but now it has not above 16,000 or 17,000. It was founded we are told by the Pisans of Peloponnesus, and afterwards became one of the 12 municipia of Tuscany. Its neighbourhood to Leghorn, which is now the chief port in the Mediterranean, though formerly of little or no note for trade, has contributed greatly to the decay of Pisa, which, however, begins to lift up its head again, under the auspices of the present grand duke, who has made it his winter residence. Between Pisa and Leghorn is a canal 16 Italian miles in length.—Its territory is very fruitful; abounding in corn, wine, and fruit, and fine cattle. The houses are well built, and the streets even, broad, and well paved; but in many places overrun with grass. The university is well endowed, and has able professors, but is not in a very flourishing condition. The exchange is a stately structure, but little frequented. The grand duke's galleys are built, and commonly stationed here. This city is also the principal residence of the order of St Stephen, and the see of an archbishop. The cathedral, a large Gothic pile, contains a great number of excellent paintings and other curiosities. This church is dedicated to St Mary; is very advantageously situated in the middle of a large piazza, and built out of a great heap of wrought marble, such as pillars, pedestals, capitals, cornices, and architraves, part of the spoils which the Pisans took in their eastern expeditions, when the republic was in a flourishing condition. The roof is supported by 76 high marble pillars of different colours, and finely gilt. Both the church and the cupola are covered with lead. The choir is painted by good hands, and the floor is mosaic work. The brazen doors are curiously wrought with the history of the Old and New Testament, by Bonanno, an ancient statuary. The chapel of St Rainerius is richly adorned with gilt metals, columns of porphyry, and fine paintings. In the middle of the nave of the church you see two brazen tombs, raised upon pillars. The marble pulpit was carved by John Pisano, and the choir by Julian da Majana. Joining thereto is the altar, over which is preserved a hollow globe or vessel of marble, wherein they kept the sacrament for the new baptized, according to the opinion of Father Mabillon. In the square before the church, you see a pillar upon which is the measure of the ancient Roman talent. In the same square with the dome, stands the baptistery, a round fabric supported by stately pillars, and remarkable for a very extraordinary echo.

On the north side of the cathedral is the burying-place, called *Campo Santo*, being covered with earth brought from the Holy Land. This burying-place is inclosed with a broad portico, well painted, and paved with grave stones. Here are a great many ancient tombs, among the rest that of Beatrix, mother of the countess Mathilda, with marble basso-relievos, which the Pisans brought from Greece, where you see the hunt of Meleager, which assisted Nicholas of Pisa in the restoration of sculpture. The walls of the Campo Santo are painted by the best masters of their times. Giotto has drawn six historical pieces of Job; and Andrea Orgagna has given a fine piece of the last judgment. Under the portico there is a decree of the city, ordering the inhabitants to wear mourning a year for the death of Cæsar.

Near the church you see a steeple in the form of a cylinder, to which you ascend by 153 steps; it inclines 15 feet on one side, which some ascribe to art, but others to the sinking of the foundation. Its inclination is so great that a plumb-line let fall from the top touches the ground at the distance of almost 15 feet from the bottom. It was built by John of Inspruck and Bonanno of Pisa, in 1174. Near this steeple is a fine hospital, dependent on that of St Maria Nuova in Florence.

The steeple of the church of the Augustinians is also very fine, being an octagon, adorned with pillars, and built by Nicholas of Pisa. In the great market-place there is a statue of Plenty, by Pierino da Vinci. In the church of St Matthew, the painting of the ceiling by the brothers Melani, natives of this city, is an admired performance. The church of the knights of St Stephen, decorated with the trophies taken from the Saracens, is all of marble, with marble steps, and a front adorned with marble statues. In the square there is a statue of Cosmo I. upon a very fine pedestal. Contiguous to the church is the convent or palace of the knights, which is worth seeing, as also the churches Della Madonna and Della Spina; the last of which was built by a beggar, whose figure you may see on the outside of the wall. It is pretended that one of the thorns of the crown which was placed on our Saviour's head is preserved here. Belonging to the university there is a great number of colleges, the chief of which is the Sapienza, where the professors read their public lectures; next to which are the colleges Puteano, Ferdinando, Ricci, and others. Besides the public palace, and that of the grand duke, there are several others with marble fronts, the finest of which is that of Lanfranchi, which, with the rest along the banks of the Arno, makes a very fine appearance. There is here a good dock, where they build the galleys, which are conveyed by the Arno to Leghorn. They have a famous aqueduct in this town, consisting of 5000 arches, which conveys the water from the hills at five miles distance. This water is esteemed the best in Italy, and is carried in flasks to Florence and Leghorn. The neighbouring country produces great store of corn and wine, but the latter is not much esteemed. They have very good butter in this neighbourhood, which is a scarce commodity in Italy. The city for its defence has a moat, walls, a castle, fort, and citadel; the last of which is a modern work. The Arno is of a considerable breadth here, and has three bridges over it, one of them of marble: two leagues below the town it falls into the sea. The physic-garden is very spacious, contains a great number of plants, and is decorated with water-works: over the door leading into it are these words, *Hic Argus sed non Briareus esto*: i. e. "Employ the eyes of Argus, but not the hands of Briareus. The air is said to be unwholesome here in summer, on account of the neighbouring morasses. Many buffaloes are bred in the neighbouring country, and their flesh is commonly eaten. Between Pisa and Lucca are hot baths. E. Long. 10. 17. N. Lat. 43. 43.

PISCARY, in our ancient statutes, the liberty of fishing in another man's waters.

PISCES, in *Astronomy*, the 12th sign or constellation of the zodiac.

PISCIDIA, a genus of plants belonging to the diadelphia class. See BOTANY *Index*.

PISCIDIA Erythrina, or *Dogwood-tree*, is employed to intoxicate fish. For this purpose, the bark is pounded small, put into bags, and soaked in salt water. The juice, which is of a red colour, makes the fish stupid, so that they are easily taken.

PISCINA, in antiquity, a large bason in a public place or square, where the Roman youth learned to swim: and which was surrounded with a high wall, to prevent filth from being thrown into it.—This word is also used for a lavatory among the Turks, placed in the middle court of a mosque or temple, where the Mussulmans wash themselves before they offer their prayers.

PISISTRATUS, an Athenian who early distinguished himself by his valour in the field, and by his address and eloquence at home. After he had rendered himself the favourite of the populace by his liberality and by the intrepidity with which he had fought their battles, particularly near Salamis, he resolved to make himself master of his country. Every thing seemed favourable to his ambitious views; but Solon alone, who was then at the head of affairs, and who had lately enforced his celebrated laws, opposed him, and discovered his duplicity and artful behaviour before the public assembly. Pisistratus was not disheartened by the measures of his relation Solon, but he had recourse to artifice. In returning from his country-house, he cut himself in various places; and after he had exposed his mangled body to the eyes of the populace, deplored his misfortunes, and accused his enemies of attempts upon his life, because he was the friend of the people, the guardian of the poor, and the reliever of the oppressed, he claimed a chosen body of 50 men from the populace to defend his person in future from the malevolence and the cruelty of his enemies. The unsuspecting people unanimously granted his request, though Solon opposed it with all his influence; and Pisistratus had no sooner received an armed band on whose fidelity and attachment he could rely, than he seized the citadel of Athens, and made himself absolute. The people too late perceived their credulity; yet, though the tyrant was popular, two of the citizens, Megacles and Lycurgus, conspired together against him, and by their means he was forcibly ejected from the city. His house and all his effects were exposed to sale; but there was found in Athens only one man who would buy them. The private dissensions of the friends of liberty proved favourable to the expelled tyrant; and Megacles, who was jealous of Lycurgus, secretly promised to restore Pisistratus to all his rights and privileges in Athens, if he would marry his daughter. Pisistratus consented; and by the assistance of his father-in-law, he was soon enabled to expel Lycurgus, and to re-establish himself. By means of a woman called *Phya*, whose shape was tall, whose features were noble and commanding, he imposed upon the people, and created himself adherents even among his enemies. Phya was conducted through the streets of the city, and showing herself subservient to the artifice of Pisistratus, she was announced as Minerva, the goddess of wisdom, and the patroness of Athens, who was come down from Heaven to re-establish her favourite Pisistratus in a power which was sanctioned by the will of Heaven, and favoured by the affection of the people. In the midst of his triumph, however, Pisistratus found himself unsupported; and some time after, when

Bibliotheca Classica, by Lempriere.

Pisistratus. when he repudiated the daughter of Megacles, he found that not only the citizens, but even his very troops, were alienated from him by the influence, the intrigues, and the bribery of his father-in-law. He fled from Athens where he no longer could maintain his power, and retired to Eubœa. Eleven years after he was drawn from his obscure retreat, by means of his son Hippias, and he was a third time received by the people of Athens as their master and sovereign. Upon this he sacrificed to his resentment the friends of Megacles, but he did not lose sight of the public good, and while he sought the aggrandizement of his family, he did not neglect the dignity and the honour of the Athenian name. He died about 528 years before the Christian era, after he had enjoyed the sovereign power at Athens for 33 years, and he was succeeded by his son Hipparchus. Pisistratus claims our admiration for his justice, his liberality, and his moderation. If he was dreaded and detested as a tyrant, the Athenians loved and respected his private virtues and his patriotism as a fellow-citizen: and the opprobrium which generally falls on his head may be attributed not to the severity of his administration, but to the republican principles of the Athenians, who hated and exclaimed against the moderation and equity of the mildest sovereign, while they flattered the pride and gratified the guilty desires of the most tyrannical of their fellow subjects. Pisistratus often refused to punish the insolence of his enemies; and when he had one day been virulently accused of murder, rather than inflict immediate punishment upon the man who had criminated him, he went to the areopagus, and there convinced the Athenians that the accusations of his enemies were groundless, and that his life was irreproachable. It is to his labours that we are indebted for the preservation of the poems of Homer; and he was the first, according to Cicero, who introduced them at Athens in the order in which they now stand. He also established a public library at Athens; and the valuable books which he had diligently collected were carried into Persia when Xerxes made himself master of the capital of Attica. Hipparchus and Hippias the sons of Pisistratus, who had received the name of *Pisistratidæ*, rendered themselves as illustrious as their father; but the flames of liberty were too powerful to be extinguished. The Pisistratidæ governed with great moderation, but the name of tyrant or sovereign was insupportable to the Athenians. Two of the most respectable of the citizens, called *Harmodius* and *Aristogiton*, conspired against them, and Hipparchus was dispatched in a public assembly. This murder was not, however, attended with any advantages; and though the two leaders of the conspiracy, who have been celebrated through every age for their patriotism, were supported by the people, yet Hippias quelled the tumult by his uncommon firmness and prudence, and for a while preserved that peace in Athens which his father had often been unable to command. This was not long to continue. Hippias was at last expelled by the united efforts of the Athenians and of their allies, and he left Attica, when he found himself unable to maintain his power and independence. The rest of the family of Pisistratus followed him in his banishment; and after they had refused to accept the liberal offers of the princes of Thessaly, and the king of Macedonia, who wished them to settle in their respective territories, the Pisistratidæ retired to Sigæum, which their father had in the summit of his power conquered and bequeathed to his posterity. After the banishment of the Pisistratidæ, the Athenians became more than commonly jealous of their liberty, and often sacrificed the most powerful of their citizens, apprehensive of the influence which popularity and a well-directed liberality might gain among a fickle and unsettled populace. The Pisistratidæ were banished from Athens about 18 years after the death of Pisistratus. Pisistratus ‖ Piso

PISMIRES, or Ants, are a kind of insects very common in Africa; of which there is so great a variety, and such innumerable swarms, that they destroy not only the fruits of the ground but sometimes even men and beasts in so little time as one single night; and would, without all doubt, prove more fatally destructive to the inhabitants, were they not so happily destroyed by a proportionable number of monkeys and other animals, who greedily devour them. The far greater part of the vast continent of Africa is afflicted with these and some other grievous plagues, and particularly with the horrid visitation of locusts, which seldom fail a year of laying waste some of the provinces.

PISO, Lucius Calpurnius, surnamed *Frugi* on account of his frugality, was descended of the illustrious family of the Pisos, which gave so many great men to the Roman republic. He was tribune of the people in the year 149 before Christ, and afterwards consul. During his tribuneship, he published a law against the crime of concussion or extortion, intitled *Lex Calpurnia de pecuniis repetundis*. He happily ended the war in Sicily. To reward the services of one of his sons, who had distinguished himself in that expedition, he left him by his will a golden crown, weighing 20 pounds. Piso joined to the qualities of a good citizen the talents of a lawyer, an orator, and historian.

Piso, *Caius Calpurnius*, a Roman consul in the year 67 before Christ, was author of the law which forbade canvassing for public offices, intitled *Lex Calpurnia de ambitu*. He displayed all the firmness worthy of a consul in one of the most stormy periods of the republic. The Roman people, deceived by the flattery of Marcus Palicanus, a turbulent and seditious fellow, were on the eve of loading themselves with the greatest disgrace, by putting the supreme authority into the hands of this man, who deserved punishment rather than honours. The tribunes of the people, by their harangues, inflamed the blind fury of the multitude, already sufficiently mutinous of themselves. In this situation, Piso mounted the rostrum, and being asked if he would declare Palicanus consul, in case the suffrages of the people should concur in the nomination, he instantly replied, that "he did not think the republic was yet involved in such darkness and despair as to be capable of committing so infamous an action." Being afterwards strongly and repeatedly called upon to say, "what he would do, if the thing should happen?" his answer was, "No, I would not name him." By this firm and laconic answer he deprived Palicanus of the dignity to which he aspired. Piso, according to Cicero, was not possessed of a quick conception, but he thought maturely, and with judgment, and, by a proper firmness, he appeared to be an abler man than he really was.

Piso, Pissasphaltum.

Piso, *Cneius Calpurnius*, was consul in the reign of Augustus, and governor of Syria under Tiberius, whose confidant he was. It is said, that by the order of this emperor he caused Germanicus to be poisoned. Being accused of that crime, and seeing himself abandoned by every body, he laid violent hands on himself in the 20th year of our Lord. He was a man of insupportable pride and excessive violence. Some instances of his wicked cruelty have been handed down to us. Having given orders in the heat of his passion to conduct to punishment a soldier, as guilty of the death of one of his companions, because he had gone out of the camp with him and returned without him, no prayers or intreaty could prevail with Piso to suspend the execution of this sentence until the affair should be properly investigated. The soldier was led without the entrenchments, and had already presented his head to receive the fatal stroke, when his companion whom he was accused of having killed made his appearance again. Whereupon the centurion, whose office it was to see the sentence executed, ordered the executioner to put up his sword into the scabbard. Those two companions, after embracing each other, are conducted to Piso, amidst the acclamations of the whole army, and a prodigious crowd of people. Piso, foaming with rage, ascends his tribune, and pronounces the same sentence of death against the whole three, without excepting the centurion who had brought back the condemned soldier, in these terms: "You I order to be put to death because you have been already condemned: you, because you have been the cause of the condemnation of your comrade; and you, because having got orders to put that soldier to death, you have not obeyed your prince."

PISSASPHALTUM, or Asphaltum, Earth-pitch; a fluid, opaque, mineral body, of a thick consistence, strong smell, readily inflammable, but leaving a residuum of grayish ashes after burning. It arises out of the cracks of the rocks, in several places in the island of Sumatra, and some other places in the East Indies, where it is much esteemed in paralytic disorders. There is a remarkable mine of it in the island of Bua, (see Bua), of which the following curious description is given by the abbé Fortis. "The island is divided into two promontories between the north and west. Crossing over the top of the latter, which is not half a mile broad, and descending in a right line towards the sea, one is conducted to a hole well known to the inhabitants. This hole extends not much above 12 feet, and from its bottom above 25 feet perpendicular, arise the marble strata which sustain the irregular masses that surround the top of the mountain.

Pissasphaltum ‖ Pistacia.

This pissasphaltum is of the most perfect quality, black and shining, very pure, odorous, and cohesive; and it comes out almost liquid, but hardens in large drops when the sun sets. On breaking many of these drops on the spot, I found that almost every one of them had an inner cavity full of very clear water.

"The greatest breadth of the tears that I saw was two inches, and the common breadth is half an inch. The chinks and fissures of the marble, from whence this bituminous pitch transudes, are not more than the thickness of a thread; and for the most part are so imperceptible, that were it not for the pitch itself, whereby they are blackened, they could not by any means be distinguished by the naked eye. To the narrowness of these passages is, no doubt, in part owing the small quantity of pissasphaltum that transpires."

After some conjectures about the origin of this mine, our author proceeds to inform us that the pissasphaltum of Bua is correspondent to that fossil production which by Hasselquist, in his Travels, is called *mumia minerale*, and *mumia nativa Persiana* by Kempfer, which the Egyptians made use of to embalm their kings (A). It is found in a cave of Mount Caucasus, which is kept shut, and carefully guarded by order of the king of Persia. One of the qualities assigned by Linnæus to the finest bitumen is to smoke when laid on the fire, as ours does, emitting a smell of pitch not disagreeable. He believes it would be very good for wounds, as the oriental mumia is, and like the pitch of Castro, which is frequently used by the Roman chirurgeons for fractures, contusions, and in many external applications. See Asphaltum, Mineralogy *Index*.

PISSELÆUM indicum, *Barbadoes Tar;* a mineral fluid of the nature of the thicker bitumens, and of all others the most approaching, in appearance, colour, and consistence, to the true pissasphaltum, but differing from it in other respects. It is very frequent in many parts of America, where it is found trickling down the sides of mountains in large quantities, and sometimes floating on the surface of the waters. It has been greatly recommended internally in coughs and other disorders of the breast and lungs.

PISTACIA, Turpentine-tree, *Pistachia nut* and *Mastich-tree;* a genus of plants belonging to the diœcia class. The most remarkable species are, 1. The terebinthus, or pistachia-tree, which grows naturally in Arabia, Persia, and Syria, whence the nuts are annually brought to Europe. In those countries it grows to the height

(A) "Mumiahi, or native Persian mummy. It proceeds from a hard rock in very small quantity. It is a bituminous juice, that transudes from the stony superficies of the hill, resembling in appearance coarse shoemakers wax, as well in its colour as in its density and ductility. While adherent to the rock it is less solid, but is formed by the warmth of the hands. It is easily united with oil, but repels water; it is quite void of smell, and very like in substance to the Egyptian mummy. When laid on burning coals, it has the smell of sulphur tempered a little with that of naphtha, not disagreeable. There are two kinds of this mummy; the one is valuable for its scarcity and great activity. The native place of the best mummy is far from the access of men, from habitations, and from springs of water, in the province of Daraab. It is found in a narrow cave, not above two fathoms deep, cut like a well out of the mass, at the foot of the rugged mountain Caucasus."—*Kempfer. Amœn. Perf.*

This description agrees perfectly with the pissasphaltum or fossil mummy of Bua, differing only in the privation of smell, which it is difficult to imagine is totally wanting in the Persian mummy.

Pistachia.

height of 25 or 30 feet: the bark of the ftem and old branches is of a dark ruffet colour, but that of the young branches is of a light brown. Thefe are garnifhed with winged leaves, compofed fometimes of two, at other times of three, pair of lobes, terminated by an odd one; thefe lobes approach towards an oval fhape, and their edges are turned backward; and thefe, when bruifed, emit a fmell fimilar to that of the fhell of the nut. Some of thefe trees produce male and others female flowers, and fome have both male and female on the fame tree. The male flowers come out from the fides of the branches in loofe bunches or catkins. They have no petals, but five fmall ftamina crowned by large four-cornered fummits filled with farina; and when this is difcharged, the flowers fall off. The female flowers come out in clufters from the fides of the branches: they have no petals, but a large oval germen fupporting three reflexed ftyles, and are fucceeded by oval nuts. 2. The lentifcus, or common maftich tree, grows naturally in Portugal, Spain, and Italy. Being an evergreen, it has been preferved in this country in order to adorn the green-houfes. In the countries where it is a native, it rifes to the height of 18 or 20 feet, covered with a gray bark on the ftem; but the branches, which are very numerous, are covered with a reddifh brown bark, and are garnifhed with winged leaves, compofed of three or four pair of fmall fpear-fhaped lobes, without an odd one at the end. 3. The orientalis, or true maftich tree of the Levant, from which the maftich is gathered, has been confounded by moft botanical writers with the lentifcus, or common maftich tree, above defcribed, though there are confiderable differences between them. The bark of the tree is brown; the leaves are compofed of two or three pair of fpear-fhaped lobes, terminated by an odd one: the outer lobes are the largeft; the others gradually diminifh, the innermoft being the leaft. Thefe turn of a brownifh colour towards the autumn, when the plants are expofed to the open air; but if they are under glaffes, they keep green. The leaves continue all the year, but are not fo thick as thofe of the common fort, nor are the plants fo hardy.

Culture. The firft fpecies is propagated by its nuts, which fhould be planted in pots filled with light kitchen-garden earth, and plunged into a moderate hot-bed to bring up the plants; when thefe appear, they fhould have a large fhare of air admitted to them, and by degrees they fhould be expofed to the open air, which at laft they will bear in all feafons, though not without great danger of being deftroyed in fevere winters. The fecond fort is commonly propagated by laying down the branches, though it may alfo be raifed from the feed in the manner already directed for the piftachia-nut tree: and in this manner alfo may the true maftich-tree be raifed. But this being more tender than any of the other forts, requires to be conftantly fheltered in winter, and to have a warm fituation in fummer.

Piftachia nuts are moderately large, containing a kernel of a pale greenifh colour, covered with a reddifh fkin. They have a pleafant, fweet, unctuous tafte, refembling that of almonds; and they abound with a fweet and well-tafted oil, which they yield in great abundance on being preffed after bruifing them: they are reckoned amongft the analeptics, and are wholefome and nutritive, and are by fome efteemed very proper to be prefcribed by way of reftoratives, eaten in fmall quantity, to people emaciated by long illnefs.

Piftachia ‖ Pifum.

PISTIL, among botanifts, the little upright column which is generally found in the centre of every flower. According to the Linnæan fyftem, it is the female part of generation, whofe office is to receive and fecrete the pollen, and produce the fruit. It confifts of three parts, viz. germen, ftylus, and ftigma. See Botany *Index*.

PISTOIA is a city of Italy, in the duchy of Tufcany, fituated on the river Stella, in a beautiful plain near the foot of the Apennine mountains. By Pliny it is called *Piftorium*, and is faid to have been once a Roman colony. At prefent it is a bifhop's fee, fuffragan of Florence. The ftreets are broad and regular, the houfes tolerably well built, but poorly inhabited for want of trade. Formerly it was an independent republic, but fince it was fubdued by the Florentines in 1200, it has been in a declining condition. The cathedral has a very handfome cupola, and a magnificent ftaircafe to afcend to it. In the chapel dedicated to St James, where his relics are preferved, the walls are almoft covered with plates of filver. Here are four marble ftatues of very good workmanfhip. The marble pulpit, the baffo-relievos, the veffel that holds the holy water, and the fquare fteeple, are the work of John Pifano. The Jefuits have a very fine college, and the Francifcans, Dominicans, and Auguftinians, good churches. In the church of Madonna dell' Umilta there are two ftatues, one of Leo X. and the other of Clement VII. The public palace, fituated in a large fquare, is a handfome building; feveral of the nobility have alfo very good houfes. In the neighbouring mountains, called by the name of Piftoia, there are many large villages, the chief of which is that of S. Marcello, belonging to the family of Cartoli. Thefe mountains are a part of the Apennines, and border on the territory of Bologna and the county of Vernio; higher up is the fource of the river Reno. The country about Piftoia, efpecially towards Florence, is exceeding fertile and delightful, covered with all forts of fruits, corn, wine, &c. and containing a vaft number of little towns, wealthy villages, and country feats, fo as to be reckoned the richeft and moft beautiful in all Tufcany. It is about 20 miles N. W. of Florence, and 30 N. E. of Pifa. E. Long. 11. 29. N. Lat. 43. 55.

PISTOL, the fmalleft piece of fire-arms, borne at the faddle-bow, on the girdle, and in the pocket.

PISTOLE, a gold coin, ftruck in Spain and in feveral parts of Italy, Switzerland, &c.—The piftole has its augmentations and diminutions, which are quadruple piftoles, double piftoles, and half piftoles. See Money-*Table*.

PISTON, in pump-work, is a fhort cylinder of metal or other folid fubftance, fitted exactly to the cavity of the barrel or body of the pump. See Hydrodynamics.

PISUM, Pease; a genus of plants belonging to the diadelphia clafs. See Botany *Index*. The fpecies are, 1. The fativum, or greater garden-pea, whofe lower ftipulæ are roundifh, indented, with taper foot-ftalks, and many flowers on a foot-ftalk. 2. The humile, or dwarf pea, with an erect branching ftalk, and leaves having two pair of round lobes. 3. The umbellatum, rofe or crown-pea, with four pointed acute ftipuli, and foot-

Pisum. stalks bearing many flowers, which terminate the stalks. 4. The maritimum, or sea-pea, with foot-stalks which are plain on their upper side, an angular stalk, arrow-pointed stipulæ, and foot-stalks bearing many flowers. 5. The Americanum, commonly called *Cape-Horn pea*, with an angular trailing stalk, whose lower leaves are spear-shaped, sharply indented, and those at the top arrow-pointed. 6. The ochrus, with membranaceous running foot-stalks, having two leaves and one flower upon a foot-stalk.

There is a great variety of garden-pease now cultivated in Britain, which are distinguished by gardeners and seedsmen, and have their different titles; but as great part of these have been seminal variations, so if they are not very carefully managed, by taking away all those plants which have a tendency to alter before the seeds are formed, they will degenerate into their original state: therefore all those persons who are curious in the choice of their seeds, look carefully over those which they design for seeds at the time when they begin to flower, and draw out all the plants which they dislike from the other. This is what they call *roguing their pease;* meaning hereby the taking out all the bad plants from the good, that the farina of the former may not impregnate the latter; to prevent which, they always do it before the flowers open. By thus diligently drawing out the bad, reserving those which come earliest to flower, they have greatly improved their pease of late years, and are constantly endeavouring to get forwarder varieties; so that it would be to little purpose in this place to attempt giving a particular account of all the varieties now cultivated: we shall therefore only mention the names by which they are commonly known, placing them according to their time of coming to the table, or gathering for use.

The golden hotspur.	Nonpareil.
The Charlton.	Sugar dwarf.
The Reading hotspur.	Sickle pea.
Master's hotspur.	Marrowfat.
Essex hotspur.	Rose or crown pea.
The dwarf pea.	Rouncival pea.
The sugar pea.	Gray pea.
Spanish Morotto.	Pig pea; with some others.

The English sea-pea is found wild upon the shore in Sussex and several other counties in England, and is undoubtedly a different species from the common pea.

The fifth species hath a biennial root, which continues two years. This was brought from Cape Horn by Lord Anson's cook, when he passed that cape, where these pease were a great relief to the sailors. It is kept here as a curiosity, but the pease are not so good for eating as the worst sort now cultivated in Britain. It is a low trailing plant; the leaves have two lobes on each foot-stalk: those below are spear-shaped, and sharply indented on their edges; but the upper leaves are small, and arrow-pointed. The flowers are blue, each foot-stalk sustaining four or five flowers; the pods are taper, near three inches long; and the seeds are round, about the size of tares.

The sixth sort is annual. This grows naturally among the corn in Sicily and some parts of Italy, but is here preserved in botanic gardens for the sake of variety. It hath an angular stalk, rising near three feet high; the leaves stand upon winged foot-stalks, each sustaining two oblong lobes. The flowers are of a pale yellow colour, shaped like those of the other sort of pea, but are small, each foot-stalk sustaining one flower; these are succeeded by pods about two inches long, containing five or six roundish seeds, which are a little compressed on their sides. These are by some persons eaten green; but unless they are gathered very young, they are coarse, and at best not so good as the common pea. It may be sown and managed in the same way as the garden pea. Pisum.

For an account of the method of cultivating the several sorts of garden pease, so as to continue them throughout the season, see GARDENING.

The gray and other large winter pease are seldom cultivated in gardens, because they require a great deal of room; they are therefore usually sown in fields. For the proper method of managing them, see AGRICULTURE.

In the *Museum Rusticum*, vol i. p. 109. we find the following method of preparing pease for hog-meat, which we shall give in the words of the ingenious farmer who communicated it.

"A few years ago (says he), I had a plentiful crop of pease on a ten acre piece, which lies near my house: when they were full poded and nearly ripe, I had them hooked in the usual manner; but before I could get them in, there came a heavy shower of rain which wetted them through and through; and the dull heavy weather, with frequent showers which followed, prevented their drying for a considerable time.

"I caused the wads to be from time to time turned, to prevent the haulm from rotting; and at length a few days sunshine dried them enough to be inned; for as they lay hollow, the wind was greatly assistant to the operation.

"Before I got them in, on examining some of the pods, I found that the pease were all sprouted to a considerable length: this was what I had expected, as I gave my crop over for lost, till after a little recollection, as the weather still continued fine, I determined to thresh them in the field.

"This was accordingly done; and the corn, after it was cast and riddled to separate it from the rubbish, was dried on my malt kiln.

"When this operation was over, I began to reflect in what manner I should dispose of my pease, being sensible that they could not be proper for seed, and standing no chance of disposing of them to any advantage in the market.

"At length, as it was then a time of war, and of course there was a great demand for pork for the use of the navy, I determined to buy a considerable number of lean hogs, that I might by their means consume this crop on my own premises, and in that manner make the most of it.

"My expectations were more than answered; for I found, by repeated experience, that three bushels of the pease I have mentioned went nearly as far in fattening the hogs I bought as four bushels got in dry and hard in the manner usually practised.

"This discovery I made several years ago, and it has turned out to my advantage; for since that time I have been quite indifferent as to the weather in which my pease are hooked, being rather better pleased, as far as relates to them, with wet than dry weather;

ther; but if the weather happens to be dry at the time they are ripe, I always caufe as many as I want for feeding my hogs, which are not a few in a year, to be regularly malted in the fame manner nearly as my barley: this management has of late fucceeded very well with me, and I therefore intend to continue it.

"Befides feeding my hogs with thefe malted peafe, I have often given them to my horfes, with which they agree very well, and are heartening food.

"Turkeys will fatten apace on them alfo, and be fine meat.

"I have applied my malted peafe to many other ufes, which I have not at prefent time to enumerate: but were they only ufed for feeding hogs and horfes, it is ftill worth while to prepare fome in this manner every year."

PIT-COAL, or STONE-COAL. See COAL, MINERALOGY *Index*, and COALERY.

The coal-trade is of infinite importance to Great Britain, which never could have arrived at its prefent commercial eminence without it; and this eminence it will be impoffible to retain if coal fhould ever become fcarce. This we truft is not likely to be the cafe, though Mr Williams expreffes great fears for it, and informs us that at Newcaftle and in many parts of Scotland, the mines near the fea are already wafted, the firft confequence of which muft be an enormous rife in the price. See his obfervations on this fubject in his *Natural Hiftory of the Mineral Kingdom*. This author fays, that coal was not difcovered till between the middle of the 12th and beginning of the 13th centuries: it is, therefore, according to him, 400 years fince it was firft difcovered in Britain, but they have not been in common ufe for more than 200 years. The fame author makes many excellent obfervations on the appearances and indications of coal, inftructions about fearching for it, remarks on falfe and doubtful fymptoms of coal; for all which, together with his obfervations on the different kinds of Scots coal, we fhall refer our readers to the work itfelf; the firft part of which, occupying a large proportion of it, is upon the *ftrata of coal*, and on the *concomitant ftrata*. See GEOLOGY and STRATA *of the earth*.

PITAHAYA (*Cactus Pitajaya*. Lin. *Syft. Vegetabilium. Jacquin. Amer.* 151. ed. 2d. p. 75. M. *E. Carthagena*), a fhrub peculiar to California, the fruit of which forms the greateft part of the harveft of the natives. Its branches are finely fluted, and rife vertically from the ftem, fo as to form a very beautiful top. The fruit is like a horfe-chefnut; in fome white, in others yellow, and in others red, but always exquifitely delicious, being a rich fweet, tempered with a grateful acid. See CACTUS, BOTANY *Index*.

PITCAIRNE, DR ARCHIBALD, an eminent phyfician and ingenious poet, was defcended from the ancient family of the Pitcairnes of Pitcairne in Fifefhire, and was born at Edinburgh on the 25th of December 1652. He commenced his ftudies at the fchool of Dalkeith; and from thence he was removed to the univerfity of Edinburgh, where he improved himfelf in claffical learning, and completed a regular courfe of philofophy. His friends, according to the authors of the *Biographia Britannica*, were defirous that he fhould follow the profeffion of theology. The unpleafant gloom, however,

which at that time hung over religion and its profeffors in Scotland, could not but very ill fuit with that native cheerfulnefs of temper and liberality of mind which made him, long after, a mark for the arrows of precifenefs and grimace. The law feems to have been his own choice, and to this fcience he turned his attention. With an ardour peculiar to himfelf, and an ambition to excel in whatever he undertook, he purfued it with fo much intenfenefs, that his health began to be impaired. On this account, his phyficians advifed him to fet out for the fouth of France. By the time he reached Paris, he was happily fo far recovered, that he determined to renew his ftudies; but being informed that there was no able profeffor of law in that city, and finding feveral gentlemen of his acquaintance engaged in the ftudy of phyfic, he went with them to the lectures and hofpitals, and employed himfelf in this manner for feveral months till his affairs called him home.

On his return, he applied himfelf chiefly to the mathematics. It is not ufual to fee the briars of this fcience and the flowers of poetry growing in the fame foil. Here, however, they were happily united; and to this union perhaps was owing that fingular command of judgment, over one of the livelieft of fancies, which appears in every part of his works. His intimacy with Dr David Gregory, the celebrated mathematical profeffor, began about the fame time; and probably conduced to cherifh his natural aptitude for this ftudy. It was then in a great meafure, new to him; it foon became his principal delight; his progrefs in it was rapid, and correfpondent to his progrefs in other purfuits. His improvements on the method of infinite feries then adopted, which Dr Wallis of Oxford afterwards publifhed, were a confpicuous and early proof of his abilities in this fcience.

Had Dr Pitcairne continued to profecute the ftudy of the law, and could he have moulded his principles to the times, the firft offices and honours of the ftate might have been looked for without prefumption as the probable reward of fuch talents as he poffeffed. Struck, however, with the charms of mathematical truth which had been lately introduced into the philofophy of medicine, and hoping to reduce the healing art to geometrical method, he unalterably determined on this lefs afpiring profeffion. At the period when he formed this refolution, the ideas of the medical world, already fufficiently confufed, were ftill farther jumbled by the difcovery of the circulation of the blood, which had as yet produced nothing but doubt, uncertainty, and aftonifhment. In Edinburgh at that time there was no fchool, no hofpital, no opportunity of improvement but the chamber and the fhop. He therefore foon after returned to Paris. Genius and induftry are unhappily not often united in the fame character: of fuch an union, however, Dr Pitcairne is a celebrated inftance. During his refidence in France, he cultivated the object of his purfuit with his natural enthufiafm, and with a fteadinefs from which he could not be diverted by the allurements of that joy which, in his hours of focial and feftive intercourfe, he always felt and always gave. Among his various occupations, the ftudy of the ancient phyficians feems to have had a principal fhare. This appears from a treatife which he publifhed fome time after his return; and it fhows, that he wifely determined

Pitcairne.

to know the progreſs of medicine from its earlieſt periods, before he attempted to reform and improve that ſcience.

On the 13th of Auguſt 1680, he received, from the faculty of Rheims, the degree of Doctor; which, on the 7th of Auguſt 1699, was likewiſe conferred on him by the univerſity of Aberdeen; both being attended with marks of peculiar diſtinction. Other medical honours are ſaid to have been conferred on him in France and elſewhere; but nothing affords a more unequivocal teſtimony to his abilities than that which the ſurgeons of Edinburgh gave, in admitting him, freely and unſolicited, a member of their college. None had ſuch opportunities of judging of his merit as a practitioner, and on no phyſician did they ever beſtow the ſame public mark of reſpect. Soon after his graduation at Rheims, he returned to Edinburgh; where, on the 29th of November 1681, the Royal College of Phyſicians was inſtituted; and his name, among others, graced the original patent from the crown.

In his *Solutio Problematis de Inventoribus*, the treatiſe above alluded to, he diſcovers a wonderful degree of medical literature, and makes uſe of it in a manner that does great honour both to his head and his heart. His object is to vindicate Dr Harvey's claim to the diſcovery of the circulation of the blood. The diſcovery was, at firſt, controverted by envy, and reprobated by ignorance. When at length its truth was fully eſtabliſhed, many invidiouſly attempted to tear the laurels from the illuſtrious Engliſhman, and to plant them on the brows of Hippocrates and others. Had the attempt been directed againſt himſelf, the generous ſoul of Pitcairne could not have exerted more zeal in a defence; and his arguments remain unanſwered.

During his reſidence in Scotland, his reputation became ſo conſiderable, that, in the year 1691, the univerſity of Leyden ſolicited him to fill the medical chair, at that time vacant. Such an honourable teſtimony of reſpect, from a foreign nation, and from ſuch an univerſity, cannot perhaps be produced in the medical biography of Great Britain. The luſtre of ſuch characters reflects honour on their profeſſion, and on the country which has the good fortune of giving them birth; and ſerves to give the individuals of that country not only a uſeful eſtimation in their own eyes, but in thoſe alſo of the reſt of the world. Dr Pitcairne's well-known political principles excluded him from public honours and promotion at home: he therefore accepted the invitation from abroad; and, on the 26th of April 1692, delivered, at Leyden, his elegant and maſterly inaugural oration: *Oratio qua oſtenditur medicinam ab omni philoſophorum ſecta eſſe liberam*. In this he clears medicine from the rubbiſh of the old philoſophy; ſeparates it from the influence of the different ſects; places it on the broad and only ſure foundation of experience; ſhows how little good inquiries into the manner how medicines operate have done to the art; and demonſtrates the neceſſity of a ſedulous attention to their effects, and to the various appearances of diſeaſe.

Nothing (ſays an elegant panegyriſt * of our author) marks a ſuperiority of intellect ſo much as the courage requiſite to ſtem a torrent of obſtinately prevailing and groundleſs opinions. For this the genius and talents of Pitcairne were admirably adapted; and, in his oration, he diſplays them to the utmoſt. It was received with the higheſt commendations; and the adminiſtrators, to teſtify their ſenſe of ſuch an acquiſition to their univerſity, greatly augmented the ordinary appointment of his chair.

* Dr Chas. Webſter, in the *Harveian Oration* at Edinburgh for the year 1781; from which performance the preſent article is chiefly extracted.

He diſcharged the duties of his office at Leyden ſo as to anſwer the moſt ſanguine expectations. He taught with a perſpicuity and eloquence which met with univerſal applauſe. Independently of the encomiums of Boerhaave and Mead, who were his pupils, the numerous manuſcript copies of his lectures, and the mutilated ſpecimen of them † which found its way into the world without his knowledge, ſhow how juſtly it was beſtowed. At the ſame time, he was not more celebrated as a profeſſor than as a practical phyſician; and notwithſtanding the multiplicity of his buſineſs in both theſe characters, he found leiſure to publiſh ſeveral treatiſes on the circulation, and ſome other of the moſt important parts of the animal economy (A).

† *Elementa Medicinæ.*

At the cloſe of the ſeſſion he ſet out for Scotland, with an intention of returning in time for the ſucceeding one. On his marrying (B) the daughter of Sir Archibald Stevenſon, the object of his journey, her relations would on no account conſent to part with him again. He was therefore reluctantly obliged to remain; and he wrote the univerſity a polite apology, which was received with the utmoſt regret. He even declined the moſt flattering ſolicitations and tempting offers to ſettle in London. Indeed he ſoon came into that extenſive practice to which his abilities entitled him, and was alſo appointed titular profeſſor of medicine in the univerſity of Edinburgh.

The uniformity of a profeſſional life is ſeldom interrupted by incidents worthy of record. Specimens, however, of that brilliant wit with which he delighted his friends in the hours of his leiſure, continue to entertain us (C): and the effects of that eminent ſkill which he exerted

(A) Dr Boerhaave gives the following character of theſe and ſome other of Dr Pitcairne's diſſertations, which were collected and publiſhed at Rotterdam, anno 1701: "Hæc ſcripta optima ſunt et perfecta, ſive legas Diſſertationem de Motu Sanguinis per Pulmones, ſive alia opuſcula, ſive ultimum tractatum de Opio." *Methodus ſtudii, ab Hallero edita*, p. 569.

(B) He had been married before to a daughter of Colonel James Hay of Pitfour, by whom he had a ſon and daughter, who both died young.

(C) Vide *Pitcarnii Poemata*.—Several of his poems, however, are obſcure, and ſome of them totally unintelligible without a key. In thoſe of them which are of a political kind, he wiſhed not to expreſs himſelf too clearly; and in others, he alludes to private occurrences which were not known beyond the circle of his companions. His poem (*Ad Lindeſium*), addreſſed to his friend Lindſey, is commented on by the authors of the *Biographia Britannica*; and it is to be regretted that it is the only one on which they have been ſolicitous to throw light.

Pitcairne. exerted in the cure of diſeaſe, ſtill operate to the good of poſterity.

The diſcovery of the circulation, while in ſome meaſure it exploded the chemical and Galenical doctrines, tended to introduce mathematical and mechanical reaſoning in their ſtead. Of this theory (D) Dr Pitcairne was the principal ſupport, and the firſt who introduced it into Britain. A mathematical turn of mind, and a wiſh for mathematical certainty in medicine, biaſſed him in its favour, and he puſhed it to its utmoſt extent. One is at a loſs whether moſt to admire or regret ſuch a waſte of talents in propping a theory which, though ſubverſive of former ones, was to fall before others but a little more ſatisfactory than itſelf. Mechanical phyſicians expected more from geometry than that ſcience could grant. They made it the foundation inſtead of an auxiliary to their inquiries, and applied it to parts of nature not admitting mathematical calculations. By paying more attention afterwards to the ſupreme influence of the living principle, the ſource of all the motions and functions of the body, it was found that theſe could not be explained by any laws of chemiſtry or mechaniſm. They are ſtill, however, involved in obſcurity; and notwithſtanding the numberleſs improvements which have taken place in the ſciences connected with medicine, will perhaps remain inſcrutable while man continues in his preſent ſtage of exiſtence.

In a ſcience ſo ſlowly progreſſive as that of medicine, Dr Pitcairne did a great deal. By labouring in vain for truth in one road, he ſaved many the ſame drudgery, and thereby ſhowed the neceſſity of another. He not only exploded many falſe notions of the chemiſts and Galeniſts which prevailed in his time, but many of thoſe too of his own ſect. In particular, he ſhowed the abſurdity of referring all diſeaſes and their cures to an alkali or an acid (E). He refuted the idea of ſecretion being performed by pores differently ſhaped (F), Bellini's opinion of efferveſcences in the animal ſpirits with the blood, and Borelli's of air entering the blood by reſpiration (G). He proved the continuity of the arteries and veins (H); and ſeems to have been the firſt who ſhowed that the blood flows from a ſmaller capacity into a larger; that the aorta, with reſpect to the arterial ſyſtem, is the apex of a cone (I). In this therefore he may be conſidered as the latent ſpring of the diſcoveries reſpecting the powers moving the blood. He introduced a ſimplicity of preſcription unknown in pharmacy before his time (K); and ſuch was the ſtate of medicine in this country, that ſcarcely have the works of any cotemporary or preceding author been thought worthy even of preſervation (L). As to the errors of his philoſophy, let it be remembered, that no theory has as yet ſtood the teſt of many years in an enlightened period. His own hung very looſely

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light. "Some parts (ſay they) of this poem, are hardly intelligible, without knowing a circumſtance in the doctor's life, which he often told, and never without ſome emotion. It is a well known ſtory of the two Platonic philoſophers, who promiſed one another, that whichever died firſt ſhould make a viſit to his ſurviving companion. This ſtory being read by Mr Lindſey and our author together, they being both then very young, entered into the ſame engagement. Soon after, Pitcairne, at his father's houſe in Fife, dreamed one morning that Lindſey, who was then at Paris, came to him, and told him he was not dead, as was commonly reported, but ſtill alive, and lived in a very agreeable place, to which he could not yet carry him. By the courſe of the poſt news came of Lindſey's death, which happened very ſuddenly the morning of the dream. When this is known, the poem is eaſily underſtood, and ſhines with no common degree of beauty.

" Lyndeſi! Stygias jamdudum vecte per undas,
" Stagnaque Cocyti non adeunda mihi;
" Excute pauliſper Lethæi vincula ſomni,
" Ut feriant animum carmina noſtra tuum.
" Te nobis, te redde tuis, promiſſa daturus
" Gaudia; ſed proavo ſis comitante redux:
" Namque novos viros mutataque regna videbis,
" Paſſaque Teutonicas ſceptra Britanna manus *.

Written in 1689.

"He then proceeds to exclaim againſt the principles and practices which produced this Teutonic violence upon the Britiſh ſceptre; and concludes with a wiſh, that Lindſey might bring Rhadamanthus with him to puniſh them.

" Unus abeſt ſcelerum vindex Rhadamanthus; amice,
" Dii faciant reditus ſit comes ille tui.

"Every one ſees how much keener an edge is given to the ſatire upon the Revolution, by making it an additional reaſon for his friend's keeping his promiſe to return him a viſit after his death."

(D) See the article PHYSIOLOGY.

(E) *Pitcarnii Diſſertationes*, Edin. edit. 1713. De opera quam præſtant corpora acida vel alkalica in curatione morborum.

(F) De circulatione ſanguinis per vaſa minima.

(G) De diverſa mole qua ſanguis fluit per pulmones.

(H) De circulatione ſanguinis per vaſa minima.

(I) De circulatione ſanguinis in animalibus genitis et non genitis.

(K) *Elementa Medicinæ*, lib. i. cap. 21. et paſſim.

(L) The firſt medical publication which diſtinguiſhed this country, after Dr Pitcairne's, was that of the Edinburgh Medical Eſſays, in the year 1732. Vide the article MONRO.

loosely about him (M); and the present generally received practice differs from his very little in reality. He treated inflammatory and hemorrhagic diseases by bleeding, purging, and blistering, as has been done uniformly and solely on the different theories since. His method of administering mercury and the bark is observed at this day; and with respect to febrile, nervous, glandular, and dropsical affections, they seem to be as often the opprobriums of the art now as they were then.

Dr Pitcairne was universally considered as the first physician of his time. No one appears ever to have had so much practice in this country, or so many consultations from abroad; and no one, from all accounts, ever practised with greater sagacity and success. The highest thought themselves honoured by his acquaintance, and the lowest were never denied his assistance and advice. The emoluments of his profession must have been great; but his charities are known to have been correspondent. The possession of money he postponed to more liberal objects; he collected one of the finest private libraries in the world; which was purchased, after his death, by the Czar of Muscovy. Notwithstanding the fatigues he underwent in the exercise of his profession, his constitution was naturally delicate. About the beginning of October 1713, he became affected with his last illness; and on the 23d he died, regretted by science as its ornament, by his country as its boast, and by humanity as its friend. He left a son and four daughters: of whom only one of the latter now survives. The present noble family of Kelly are his grandchildren.

Some anonymous publications are attributed to Dr Pitcairne, particularly a treatise *De Legibus Historiæ Naturalis*, &c.; but the only ones he thought proper to legitimate are his *Dissertationes Medicæ*, and a short essay *De Salute*.

PITCAITHLY. See PITKEATHLY.

PITCH, a tenacious oily substance, drawn chiefly from pines and firs, and used in shipping, medicine, and various arts: or it is more properly tar inspissated by boiling it over a slow fire. See TAR.

Fossil PITCH. See PETROLEUM, MINERALOGY *Index*.

PITCHING, in sea-affairs, may be defined the vertical vibration which the length of a ship makes about her centre of gravity; or the movement by which she plunges her head and after-part alternately into the hollow of the sea. This motion may proceed from two causes: the waves which agitate the vessel; and the wind upon the sails, which makes her stoop to every blast thereof. The first absolutely depends upon the agitation of the sea, and is not susceptible of inquiry; and the second is occasioned by the inclination of the masts, and may be submitted to certain established maxims.

When the wind acts upon the sails, the mast yields to its effort, with an inclination which increases in proportion to the length of the mast, to the augmentation of the wind, and to the comparative weight and distribution of the ship's lading.

The repulsion of the water, to the effort of gravity, opposes itself to this inclination, or at least sustains it, by as much as the repulsion exceeds the momentum, or absolute effort of the mast, upon which the wind operates. At the end of each blast, when the wind suspends its action, this repulsion lifts the vessel; and these successive inclinations and repulsions produce the movement of pitching, which is very inconvenient; and, when it is considerable, will greatly retard the course, as well as endanger the mast, and strain the vessel.

PITH, in vegetation, the soft spongy substance contained in the central parts of plants and trees *. *See Plant.

PITHO, in fabulous history, the goddess of persuasion among the Romans. She was supposed to be the daughter of Mercury and Venus, and was represented with a diadem on her head, to intimate her influence over the hearts of man. One of her arms appeared raised as in the attitude of an orator haranguing in a public assembly; and with the other she holds a thunderbolt and fetters, made with flowers, to signify the powers of reasoning and the attractions of eloquence. A caduceus, as a symbol of persuasion, appears at her feet, with the writings of Demosthenes and Cicero, the two most celebrated among the ancients, who understood how to command the attention of their audience, and to rouse and animate their various passions.—A Roman courtezan. She received this name on account of the allurements which her charms possessed, and of her winning expressions.

PITHOM, one of the cities that the children of Israel built for Pharaoh in Egypt (Exod. i. 11.) during the time of their servitude. This is probably the same city with Pathumos mentioned by Herodotus, which he places upon the canal made by the kings Necho and Darius to join the Red sea with the Nile, and by that means with the Mediterranean. We find also in the ancient geographers, that there was an arm of the Nile called *Pathmeticus*, *Phatmicus*, *Phatnicus*, or *Phatniticus*. Bochart says, that Pithom and Raamses are about five leagues above the division of the Nile, and beyond this river; but this assertion has no proof from antiquity. This author contents himself with relating what was said of Egypt in his own time. Marsham will have Pithom to be the same as Pelusium or Damietta.

PITHOU, or PITHOEUS, *Peter*, a Frenchman of great literary eminence, was descended from an ancient and noble family in Normandy, and born at Troyes in 1539. His taste for literature appeared very early, and his father cultivated it to the utmost. He first studied at Troyes, and was afterwards sent to Paris, where he became first the scholar, and then the friend, of Turnebus. Having finished his pursuits in languages and the belles lettres, he was removed to Bourges, and placed under Cujacius in order to study civil law. His father was well skilled in his profession, and has left no inconsiderable

(M) Patet (*says he*) medicinam esse memoriam eorum quæ cuilibet morbo usus ostendit fuisse utilia. Nam notas non esse corporum intra venas fluentium aut consistentium naturas, adeoque sola observatione innotescere quid cuique morbo conveniat postquam sæpius eadem eidem morbo profuisse comperimus. *De Div. Morb.*

Pithou, Pitiscus. inconfiderable fpecimen of his judgment in the advice he gave his fon with regard to acquiring a knowledge of it; which was, not to fpend his time and pains upon voluminous and barren commentators, but to confine his reading chiefly to original writers. He made fo rapid a progrefs, that at feventeen he was able to fpeak extempore upon the moft difficult queftions; and his mafter was not afhamed to own, that even himfelf had learned fome things of him. Cujacius afterwards removed to Valence; and Pithœus followed him, and continued to profit by his lectures till the year 1560. He then returned to Paris, and frequented the bar of the parliament there, in order to join practical forms and ufages to his theoretic knowledge.

In 1563, being then 24, he publifhed *Adverfaria Subcefiva*, a work highly applauded by Turnebus, Lipfius, and other learned men; and which laid the foundation of that great and extenfive fame he afterwards acquired. Soon after this, Henry III. advanced him to fome confiderable pofts; in which, as well as at the bar, he acquitted himfelf moft honourably. Pithœus being a Proteftant, it was next to a miracle that he was not involved in the terrible maffacre of St Bartholomew in 1572; for he was at Paris where it was committed, and in the fame lodgings with feveral Huguenots, who were all killed. It feems indeed to have frightened him out of his religion; which having, according to the cuftom of converts, examined and found to be erroneous, he foon abjured, and openly embraced the Catholic faith. He afterwards attended the duke of Montmorency into England; and on his return, from his great wifdom, good nature, and amiable manners, he became a kind of oracle to his countrymen, and even to foreigners, who confulted him on all important occafions; an inftance of which we have in Ferdinand the grand duke of Tufcany, who not only confulted him, but even fubmitted to his determination in a point contrary to his interefts. Henry III. and IV. were greatly obliged to him for combating the League in the moft intrepid manner, and for many other fervices, in which he had recourfe to his pen as well as to other means.

Pithœus died upon his birth-day in 1596, leaving behind him a wife whom he had married in 1579, and fome children. Thuanus fays he was the moft excellent and accomplifhed man of the age in which he lived; and all the learned have agreed to fpeak well of him. He collected a very valuable library, containing a variety of rare manufcripts, as well as printed books; and he took many precautions to hinder its being difperfed after his death, but in vain. He publifhed a great number of works upon law, hiftory, and claffical literature; and he gave feveral new and correct editions of ancient writers. He was the firft who made the world acquainted with the Fables of Phædrus: which, together with the name of their author, were utterly unknown and unheard of, till publifhed from a manufcript of his.

PITISCUS, Samuel, a learned antiquary, was born at Zutphen, and was rector of the college of that city, and afterwards of St Jerome at Utrecht, where he died on the firft of February 1717, aged 90. He wrote, 1. *Lexicon Antiquitatum Romanarum*, in two volumes folio; a work which is efteemed. 2. Editions of many Latin authors, with notes; and other works.

Pitkeathly, Pitot. PITKEATHLY, or Pitcaithly, is the name of an eftate in Strathern in Scotland, famous for its mineral waters. An intelligent traveller * gives the following account of it. "The fituation of the mineral fpring at Pitcaithly, the efficacy with which its waters are faid to operate in the cure of the difeafes for which they are ufed, and the accommodations which the neighbourhood affords, are all of a nature to invite equally the fick and the healthy. Two or three houfes are kept in the ftyle of hotels for the reception of ftrangers. There is no long-room at the well; but there are pleafing walks through the adjoining fields. Good roads afford eafy accefs to all the circumjacent country. This delightful tract of Lower Strathern is filled with houfes and gardens, and ftations from which wide and delightful profpects may be enjoyed: all of which offer agreeable points to which the company at the well may direct their forenoon excurfions; converfation, mufic, dances, whift, and that beft friend to elegant, lively, and focial converfe, the tea-table, are fufficient to prevent the afternoons from becoming languid: and in the evenings nothing can be fo delightful as a walk when the fetting-fun fheds a foft flanting light, and the dew has juft not begun to moiften the grafs.—Thus is Pitcaithly truly a rural watering-place. The company cannot be at any one time more in number than two or three families. The amufements of the place are fimply fuch as a fingle family might enjoy in an agreeable fituation in the country: only the fociety is more diverfified by the continual change and fluctuation of the company." The waters of this place are of a fulphureous nature.

* Heron's *Journey through the Weftern Counties of Scotland.*

PITOT, Henry, of a noble family in Languedoc, was born at Aramont in the diocefe of Ufez, on the 29th of May 1695, and died there on the 27th of December 1771, aged 76. He learned the mathematics without a mafter, and went to Paris in 1718, where he formed a clofe friendfhip with the illuftrious Reaumur. In 1724, he was admitted a member of the Royal Academy of Sciences at Paris, and in a few years rofe to the degree of a penfioner. Befides a vaft number of Memoirs printed in the collection of that fociety, he publifhed in 1731 the Theory of the Working of Ships, in one volume 4to; a work of confiderable merit, which was tranflated into Englifh, and made the author be admitted into the Royal Society of London. In 1740, the ftates-general of Languedoc made choice of him for their chief engineer, and gave him at the fame time the appointment of infpector general of the canal which unites the two feas. That province is indebted to him for feveral monuments of his genius, which will tranfmit his name with luftre to pofterity. The city of Montpellier being in want of water, Pitot brought from the diftance of three leagues the water of two fprings which furnifh a plentiful fupply of that neceffary article. They are brought to the magnificent Place du Peyron, and thence are diftributed through the city. This aftonifhing work is the admiration of all ftrangers. The illuftrious marfhal de Saxe was the great patron and friend of Pitot, who had taught this hero the mathematics. In 1754 he was honoured with the order of St Michael. In 1735, he had married Maria Leonina Pharambier de Sabballoua, defcended of a very ancient noble family of Navarre. By this marriage he had only one fon, who was firft advocate-general of the court of accounts, aids,

aids, and finances of Montpellier. Pitot was a practical philosopher, and a man of uncommon probity and candour. He was also a member of the Royal Society of Sciences of Montpellier; and his eulogium was pronounced in 1772 by M. de Ratte perpetual secretary, in presence of the states of Languedoc; as it likewise was at the Royal Academy of Sciences of Paris by Abbé de Fouchi, who was then secretary.

PITS, John, the biographer, was born in 1560, at Aulton in Hampshire, and educated at Wykeham's school, near Winchester, till he was about 18 years of age; when he was sent to New-college in Oxford, and admitted probationer fellow. Having continued in that university not quite two years, he left the kingdom as a voluntary Romish exile, and retired to Douay; thence he went to the English college at Rheims, where he remained about a year; and then proceeded to Rome, where he continued a member of the English college near seven years, and was made a priest. In 1589 he returned to Rheims; and there, during two years, taught rhetoric and the Greek language. He now quitted Rheims on account of the civil war in France; and retired to Pont à Mousson in Lorrain, where he took the degrees of master of arts and bachelor in divinity. Hence he travelled into Germany, and resided a year and a half at Triers, where he commenced licentiate in his faculty. From Triers he visited several of the principal cities in Germany; and continuing three years at Ingoldstadt in Bavaria, took the degree of doctor in divinity. Thence having made the tour of Italy, he returned once more to Lorrain; where he was patronised by the cardinal of that duchy, who preferred him to a canonry of Verdun; and about two years after he became confessor to the duchess of Cleves, daughter to the duke of Lorrain. During the leisure he enjoyed in this employment, he wrote in Latin the lives of the kings, bishops, apostolical men, and writers of England. The last of these, commonly known and quoted by this title, *De illustribus Angliæ scriptoribus*, was published after his death. The three first remain still in manuscript among the archives of the collegiate church of Liverdun. The duke of Cleves dying after Pits had been about twelve years confessor to the duchess, she returned to Lorrain, attended by our author, who was promoted to the deanery of Liverdun, which, with a canonry and officialship, he enjoyed to the end of his life. He died in 1616, and was buried in the collegiate church. Pits was undoubtedly a scholar, and not an inelegant writer; but he is justly accused of ingratitude to Bale, from whom he borrowed his materials, without acknowledgement. He quotes Leland with great familiarity, without ever having seen his book: his errors are innumerable, and his partiality to the Romish writers most obvious; nevertheless we are obliged to him for his account of several popish authors, who lived abroad at the beginning of the Reformation.

PITT, Christopher, an eminent English poet, celebrated for his excellent translation of Virgil's Æneid, was born in the year 1699. Having studied four years at New-college, Oxford, he was presented to the living of Pimperne in Dorsetshire, which he held during the remainder of his life. He had so poetical a turn, that while he was a school-boy he wrote two large folios of manuscript poems, one of which contained an entire translation of Lucan. He was much esteemed while at the university; particularly by the celebrated Dr Young, who used familiarly to call him his *son*. Next to his fine translation of Virgil, Mr Pitt gained the greatest reputation by his excellent English translation of Vida's Art of Poetry. This amiable poet died in the year 1748, without leaving, it is said, one enemy behind him.

Pitt, *William*, earl of Chatham, a most celebrated British statesman and patriot, was born in November 1708. He was the youngest son of Robert Pitt, Esq. of Boconnock in Cornwall; and grandson of Thomas Pitt, Esq. governor of Fort St George in the East Indies, in the reign of Queen Anne, who sold an extraordinary diamond to the king of France for 135,000l. and thus obtained the name of *Diamond Pitt*. His intellectual faculties and powers of elocution very soon made a distinguished appearance; but at the age of 16 he felt the attacks of an hereditary and incurable gout, by which he was tormented at times during the rest of his life.

His lordship entered early into the army, and served in a regiment of dragoons. Through the interest of the duchess of Marlborough he obtained a seat in parliament before he was 21 years of age. His first appearance in the house was as representative of the borough of Old Sarum, in the ninth parliament of Great Britain. In the 10th he represented Seaford, Aldborough in the 11th, and the city of Bath in the 12th; where he continued till he was called up to the house of peers in 1766. The intention of the duchess in bringing him thus early into parliament was to oppose Sir Robert Walpole, whom he kept in awe by the force of his eloquence. At her death the duchess left him 10,000l. on condition, as was then reported, that he never should receive a place in administration. However, if any such condition was made, it certainly was not kept on his lordship's part. In 1746, he was appointed vice-treasurer of Ireland, and soon after paymaster general of the forces, and sworn a privy-counsellor. He discharged the office of paymaster with such honour and inflexible integrity, refusing even many of the perquisites of his office, that his bitterest enemies could lay nothing to his charge, and he soon became the darling of the people. In 1755 he resigned the office of paymaster, on seeing Mr Fox preferred to him. The people were alarmed at this resignation; and being disgusted with the unsuccessful beginning of the war, complained so loudly, that, on the 4th December 1756, Mr Pitt was appointed secretary of state in the room of Mr Fox afterwards Lord Holland; and other promotions were made in order to second his plans. He then took such measures as were necessary for the honour and interest of the nation; but in the month of February 1757, having refused to assent to the carrying on a war in Germany for the sake of his majesty's dominions on the continent, he was deprived of the seals on the 5th of April following. Upon this the complaints of the people again became so violent, that on the 29th of June he was again appointed secretary, and his friends filled other important offices. The success with which the war was now conducted is universally known; yet on the 5th of October 1761, Mr Pitt, to the astonishment of almost the whole kingdom, resigned the seals into his majesty's own hands. The reason of this was, that Mr Pitt,

Pitt. Pitt, having received certain intelligence that the family-compact was signed between France and Spain, and that the latter was about to join France against us, thought it necessary to prevent her by commencing hostilities first. Having communicated this opinion in the privy-council, the other ministers urged that they would think twice before they declared war against that kingdom. "I will not give them leave to think (replied Mr Pitt); this is the time, let us crush the whole house of Bourbon. But if the members of this board are of a different opinion, this is the last time I shall ever mix in its councils. I was called into the ministry by the voice of the people, and to them I hold myself answerable for my conduct. I am to thank the ministers of the late king for their support; I have served my country with success; but I will not be responsible for the conduct of the war any longer than while I have the direction of it." To this bold declaration, the lord who then presided in council made the following reply. "I find the gentleman is determined to leave us; nor can I say that I am sorry for it, since he would otherwise have certainly compelled us to leave him. But if he is resolved to assume the right of advising his majesty, and directing the operations of the war, to what purpose are we called to this council? When he talks of being responsible to the people, he talks the language of the house of commons, and forgets that at this board he is responsible only to the king. However, though he may possibly have convinced himself of his infallibility, still it remains that we should be equally convinced before we can resign our understandings to his direction, or join with him in the measure he proposes."

This conversation, which was followed by Mr Pitt's resignation, is sufficient to show the haughtiness and imperious temper of our minister. However, these very qualities were sometimes productive of great and good consequences, as appears from the following anecdote. —Preparatory to one of the secret expeditions during the war which ended in 1763 the minister had given orders to the different presiding officers in the military, navy, and ordnance departments, to prepare a large body of forces, a certain number of ships, and a proportionable quantity of stores, &c. and to have them all ready against a certain day. To these orders he received an answer from each of the officers, declaring the total impossibility of a compliance with them. Notwithstanding it was then at a very late hour, he sent immediately for his secretary; and after expressing his resentment at the ignorance or negligence of his majesty's servants, he gave the following commands: —"I desire, Mr Wood, that you will immediately go to Lord Anson; you need not trouble yourself to search the admiralty, he is not to be found there; you must pursue him to the gaming-house, and tell him from me, that if he does not obey the orders of government which he has received at my hands, that I will most assuredly impeach him. Proceed from him to Lord Ligonier; and though he should be bolstered with harlots, undraw his curtains, and repeat the same message. Then direct your course to Sir Charles Frederick, and assure him that if his majesty's orders are not obeyed, they shall be the last which he shall receive from me." In consequence of these commands, Mr Wood proceeded to White's, and told his errand to the first lord of the admiralty; who insisted that the secretary of state was out of his senses, and it was impossible to comply with his wishes: "however, (added he), as madmen must be answered, tell him that I will do my utmost to satisfy him." From thence he went to the commander in chief of the forces, and delivered the same message. He also said that it was an impossible business; "and the secretary knows it, (added the old lord): nevertheless, he is in the right to make us do what we can; and what it is possible to do, inform him, shall be done." The surveyor general of the ordnance was next informed of Mr Pitt's resolution; and, after some little consideration, he began to think that the orders might be completed within the time prescribed. The consequence at last was, that every thing, in spite of impossibilities themselves, was ready at the time appointed.

After his resignation in 1761, Mr Pitt never had any share in administration. He received a pension of 3000l. a-year, to be continued after his decease, during the survivancy of his lady and son; and this gratuity was dignified with the title of *Baroness of Chatham* to his lady, and that of *Baron* to her heirs male. Mr Pitt at that time declined the title of nobility; but in 1766 accepted of a peerage under the title of *Baron Pynsent and Earl of Chatham*, and at the same time he was appointed lord privy-seal.

This acceptance of a peerage proved very prejudicial to his lordship's character. However, he continued stedfast in his opposition to the measures of administration. His last appearance in the house of lords was on the 2d of April 1778. He was then very ill and much debilitated: but the question was important, being a motion of the duke of Richmond to address his majesty to remove the ministers, and make peace with America on any terms. His lordship made a long speech, which had certainly overcome his spirits: for attempting to rise a second time, he fell down in a convulsive fit; and though he recovered for that time, his disorder continued to increase till the 11th of May, when he died at his seat at Hayes. His death was lamented as a national loss. As soon as the news reached the house of commons, which was then sitting, Colonel Barré made a motion, that an address should be presented to his majesty, requesting that the earl of Chatham should be buried at the public expence. But Mr Rigby having proposed the erecting of a statue to his memory, as more likely to perpetuate the sense of his great merits entertained by the public, this was unanimously carried. A bill was soon after passed, by which 4000l. a-year was settled upon John now earl of Chatham, and the heirs of the late earl to whom that title may descend.—His lordship was married in 1754 to Lady Hester, sister to the earl of Temple; by whom he had three sons and two daughters.

Never perhaps was any life so multifarious as that of Lord Chatham; never did any comprise such a number of interesting situations. To bring the scattered features of such a character into one point of view, is an arduous task. The author of the history * of his life has attempted to do it; and with the outlines of what he has said in summing up his character, we shall finish our biographical sketch of this wonderful man.

* *History of the Life of William Pitt, Earl of Chatham.*

"One of the first things that strikes us, in the recollection of Chatham's life, is the superior figure he makes among his cotemporaries. Men of genius and attraction, a Carteret, a Townshend, and I had almost said

ſaid a Mansfield, however pleaſing in a limited view, appear evidently in this compariſon to ſhrink into narrower dimenſions, and walk a humbler circle. All that deſerves to arreſt the attention, in taking a general ſurvey of the age in which he lived, is compriſed in the hiſtory of Chatham. No character ever bore the more undiſputed ſtamp of originality. Unreſembled and himſelf, he was not born to accommodate to the genius of his age. While all around him were depreſſed by the uniformity of faſhion, or the contagion of venality, he ſtood aloof. He conſulted no judgment but his own; and he acted from the untainted dictates of a comprehenſive ſoul.

"The native royalty of his mind is eminently conſpicuous. He felt himſelf born to command; and the free ſons of Britain implicitly obeyed him. In him was realiſed the fable of Orpheus; and his genius, his ſpirit, his eloquence, led millions in his train, ſubdued the rugged ſavage, and diſarmed the fangs of malignity and envy. Nothing is in its nature ſo inconſiſtent as the breath of popular applauſe: and yet that breath was eminently his during the greater part of his life. Want of ſucceſs could not divert it; inconſiſtency of conduct could not change its tenor. The aſtoniſhing extent of his views, and the myſterious comprehenſion of his plans, did not in one reſpect ſet him above little things: nothing that was neceſſary to the execution of his deſigns was beneath him. In another reſpect, however, he was infinitely eſtranged to little things: ſwallowed up in the buſineſs of his country, he did not think of the derangement of his own private affairs; for, though indiſpoſed to all the modes of diſſipated expence, his affairs, even when his circumſtances were much improved, were always deranged. But the features that ſeem moſt eminently to have characteriſed him, were ſpirit and intrepidity: they are conſpicuous in every action and in every turn of his life; nor did this ſpirit and intrepidity leave him even at the laſt.

"The manners of Lord Chatham were eaſy and bland, his converſation was ſpirited and gay, and he readily adapted himſelf to the complexion of thoſe with whom he aſſociated. That artificial reſerve, which is the never-failing refuge of ſelf-diffidence and cowardice, was not made for him. He was unconſtrained as artleſs infancy, and generous as the noon-day ſun: yet had he ſomething impenetrable that hung about him. By an irreſiſtible energy of ſoul, he was haughty and imperious. He was incapable of aſſociating councils, and he was not formed for the ſweeteſt bands of ſociety. He was a pleaſing companion, but an unpliant friend.

"The ambition of our hero, however generous in its ſtrain, was the ſource of repeated errors in his conduct. To the reſignation of Lord Carteret, and again, from the commencement of the year 1770, his proceedings were bold and uniform. In the intermediate period they were marked with a verſatility, incident only in general to the moſt flexible minds. We may occaſionally trace in them the indeciſion of a candidate, and the ſuppleneſs of a courtier. In a word, he aimed at the impoſſible taſk of flattering at once the prejudices of a monarch, and purſuing unremittedly the intereſts of the people.

"A feature, too, ſufficiently prominent in his character, was vanity, or perhaps pride and conſcious ſuperiority. He dealt ſurely ſomewhat too freely with invective. He did not pretend to an ignorance of his talents, or to manage the diſplay of his important ſervices. Himſelf was too often the hero of his tale; and the ſucceſſes of the laſt war the burden of his ſong *.

"Patriotiſm was alſo the ſource of ſome of his imperfections. He loved his country too well; or, if that may ſound abſurd, the benevolence at leaſt, that embraces the ſpecies, had not ſufficient ſcope in his mind. He once ſtyled himſelf *a lover of honourable war;* and in ſo doing he let us into one trait of his character. The friend of human kind will be an enemy to all war. He indulged too much a puerile antipathy to the houſe of Bourbon: and it was ſurely the want of expanſive affections that led him to ſo unqualified a condemnation of American independency.

"But the eloquence of Lord Chatham was one of his moſt ſtriking characteriſtics. He far outſtripped his competitors, and ſtood alone the rival of antiquity.

"His eloquence was of every kind. No man excelled him in cloſe argument and methodical deduction: but this was not the ſtyle into which he naturally fell. His oratory was unlaboured and ſpontaneous: he ruſhed at once upon the ſubject; and uſually illuſtrated it rather by glowing language and original conception, than by cool reaſoning. His perſon was tall and dignified; his face was the face of an eagle; his piercing eye withered the nerves, and looked through the ſouls of his opponents; his countenance was ſtern, and the voice of thunder ſat upon his lips: anon, however, he could deſcend to the eaſy and the playful. His voice ſeemed ſcarcely more adapted to energy and to terror, than it did to the melodious, the inſinuating, and the ſportive. If, however, in the enthuſiaſm of admiration, we can find room for the frigidity of criticiſm, his action ſeemed the moſt open to objection. It was forcible, uniform, and ungraceful. In a word, the moſt celebrated orators of antiquity were in a great meaſure the children of labour and cultivation. Lord Chatham was always natural and himſelf."

To the misfortune of letters, and of poſterity, it has been ſaid, his lordſhip never publiſhed any thing. Lord Cheſterfield ſays, "that he had a moſt happy turn for poetry: but it is more than probable that Cheſterfield was deceived; for we are told by his biographer that his verſes to Garrick were very meagre, and Lord Chatham himſelf ſaid that he ſeldom indulged and ſeldom avowed it. It ſhould ſeem, then, that he himſelf ſet no great value upon it. Perhaps a proper confidence of one's ſelf is eſſential to all extraordinary merit. Why ſhould we ambitiouſly aſcribe to one mind every ſpecies of human excellence? But though he was no poet, it is more than probable, that he would have excelled as much in writing proſe as he did in ſpeaking it.

Pitt, *the Right Honourable William,* was the fourth child of that illuſtrious orator and conſummate ſtateſman, William Pitt, the firſt earl of Chatham, and was born on the 28th of May 1759. Nicholas Pitt, who lived in the reign of Henry VI. was the common anceſtor of the noble families of Chatham, Camelford, and Rivers. Thomas Pitt, the firſt of the name who attained any conſiderable eminence, was governor of Fort St George in the Eaſt Indies, where he purchaſed, as noticed in the preceding life, for 20,400l. ſterling, the extraordinary diamond called the *regent,* weighing 127 carats, and which was ſold to the king of France for the enormous ſum of 135,000l. ſterling. This diamond it is ſaid, now occupies a conſpicuous place in the imperial diadem of Bonaparte.

* Ending in 1763.

Pitt. Bonaparte. By means of this vaſt ſum he was enabled to purchaſe a conſiderable eſtate in Cornwall; yet his grand-children were poorly provided for, particularly the great earl of Chatham, but what he wanted in opulence was abundantly ſupplied by the uncommon talents and abilities, which nature conferred upon him in the profuſeſt manner. Although he betook himſelf for ſupport to the profeſſion of arms, he never roſe higher than to the rank of a cornet of horſe, of which Sir Robert Walpole, with unexampled meanneſs, deprived him, becauſe he had the boldneſs and integrity to oppoſe his adminiſtration. This, however, proved no real obſtacle to his preferment in the ſtate, for in the year 1756 he became prime miniſter.

As the preſent earl of Chatham was deſtined for the army, and another ſon James-Charles for the navy, lord Chatham reſolved to train up William to the profeſſion of a ſtateſman. Having therefore confided the care of his other two ſons to others, he took William under his own immediate inſpection, whoſe rapid progreſs cheered the ſolitude, and illumed the declining days of this extraordinary man, who already began to preſage his future greatneſs. His ſchool exerciſes were performed under the care of a private tutor, a Mr, afterwards Dr Wilſon, while his noble father embraced every opportunity of converſing with him on every intereſting topic with the utmoſt freedom, in order to expand his mind, and mature his judgment. He alſo made him declaim from a chair or a table, well knowing that the gift of eloquence is a valuable acquiſition for a young man who wiſhes to arrive at eminence, and that it had ſupplied the deficiencies of fortune in his own perſon.

It was reſolved on, at a proper period, to ſend William to one of the univerſities, and on this occaſion Cambridge was preferred to Oxford, from a decided opinion entertained by many, that the political doctrines inculcated at the former were more liberal than thoſe uſually propagated at the latter. He was accordingly placed under the tuition of Dr Turner of Pembroke Hall. Dr Prettyman, afterwards biſhop of Lincoln, alſo participated in the care of his education, and was his private inſtructor. During his reſidence at Cambridge, it appears certain that the morals and conduct of Mr Pitt were unimpeachable, not in the ſmalleſt degree contaminated by the powerful example of the young nobility. Here he took his bachelor's degree, and alſo that of A. M. and acquired ſuch reputation in the univerſity for talents, induſtry, and propriety of deportment, as proved of great advantage to him in his ſubſequent purſuits through life.

When Mr Pitt left the univerſity, he was entered at Lincoln's Inn, much about the ſame time with Mr Addington, whoſe father had been both the phyſician and friend of his family, and was enabled to be called to the bar in the ſpace of three years, having received ſome marks of favour on account of his degree. He made choice of the weſtern circuit as the ſcene of his firſt efforts; but having little practice as a lawyer, he had of conſequence but little celebrity; and it is probable that he was ill qualified, on the ſcore of patient and laborious inveſtigation, for a purſuit in which nothing great can be accompliſhed, without the perſevering induſtry of a whole life.

Fortune at this time ſeemed eager to heap favours upon him of another kind. Being bred a ſtateſman, the houſe of commons was of courſe the place where he Pitt. was to begin his political career. He was adviſed by numerous friends to propoſe himſelf a candidate for the univerſity of Cambridge, but he failed of ſucceſs from the want of ſufficient influence. Accident, however, brought about what the deſigns of his friends could not accompliſh. The duke of Rutland aſked Sir James Lowther (afterwards earl of Lonſdale), if he could poſſibly make room in any of his boroughs, to bring in his young friend Mr Pitt, who had thus loſt his election for Cambridge. He was choſen member for the borough of Appleby. About this time the American war was raging with unabated violence, which Mr Pitt, following the example and advice of his father, reprobated as one of the moſt ſhameful and ruinous conflicts of modern times. Having eſpouſed the conſtitutional and popular ſide of this important queſtion, his opening talents were diſplayed to no common advantage, and he was not only regarded as a promiſing ſpeaker, but as deſtined at ſome future period to rank high in the councils of his native country. This was truly honourable to ſo young a man, when it is remembered that one houſe could then boaſt of a Rockingham, a Richmond, and a Shelburne, and the other of a Saville, a Dunning, a Burke, a Barré, and a Fox. Yet there was ſtill room for our juvenile orator, and the recollection of the eloquence, the talents, and the meritorious ſervices of his father, contributed greatly to fix the attention of mankind on the deportment of a favourite ſon.

About this time the extent of the royal prerogative engaged the attention both of the parliament and the public, and a vote of the commons, "that the influence of the crown had increaſed, was increaſing, and ought to be diminiſhed," plainly pointed to an object, whether real or imaginary, which occaſioned a conſiderable degree of diſcontent. Mr Burke, then in the zenith of his popularity, encouraged by numerous ſymptoms of jealouſy, once more brought forward his plan of economy, which being founded on a progreſſive retrenchment, appeared admirably calculated to diminiſh the influence of the crown. It is needleſs to add that it was oppoſed by the miniſter (Lord North), but it was ably ſupported by Mr Pitt, who forcibly ridiculed every objection that could be brought againſt it. The bill was rejected after a long debate, but afterwards introduced at a more auſpicious period, and to a certain extent carried into effect.

Mr Fox having moved that miniſters ſhould immediately take every poſſible meaſure for concluding a peace with our American colonies, he was powerfully ſupported by Mr Pitt, whoſe commanding eloquence engaged the whole attention of the houſe, while he reprobated the cruelty and impolicy of the conteſt with our colonies. He declared that it was conceived in injuſtice, nurtured and brought forth in folly, and its footſteps were marked with blood, ſlaughter, perſecution, and devaſtation. Many handſome compliments were paid him by two eminent judges of real merit, we mean the lord advocate of Scotland (now Viſcount Melville), and Mr Wilkes. The former, in particular, declared that his powerful abilities and brilliant eloquence were univerſally acknowledged proofs, that the aſtoniſhing extent and force of an exalted underſtanding had deſcended, in an hereditary line, from the late illuſtrious poſſeſſor of them, to a ſon equally endowed with all the fire, and ſtrength, and grace of oratory.

Pitt.

A more equal reprefentation of the people in parliament was one of the principal objects to which the nation directed its attention, next to the American war. It was admitted to be the undoubted prerogative of the crown to declare war; but as the fupplies were entrufted to the management of the reprefentatives of the people, it was affirmed by fome that minifters could not have carried on a conteft accompanied with the wafte of fo much blood and treafure, had it not being owing to the corruption and venality of parliament. To derive advantage from paft experience; to confer on the people their due importance in fuch a mixed government as that of Britain, and reftore the conftitution to its original purity, became by this time the grand object of Mr Pitt's exertions. He was as yet untainted by the fafcinating charms of power and authority, and confidered a well-earned fame as the beft, the only reward of his laudable endeavours. He accordingly brought the principles and conduct of his opponents to fuch a teft as they fuccefsfully employed againft himfelf, in order to wound his feelings, and convict him of inconfiftency, by turning his back on his once favourite fentiments. When many cities and counties endeavoured to obtain a reform in parliament, Mr Pitt actually fat in a convention of delegates, met together in the neighbourhood of the place where the legiflature held its fittings.

The American war in the mean time was drawing to a termination, and the fpoils of the office of the former minifter became the reward of thofe who oppofed him. During the fhort exiftence of the Rockingham adminiftration, contractors were excluded from the houfe of commons; officers belonging to the cuftoms and excife were declared unqualified to vote at elections; the proceedings refpecting the Middlefex election were refcinded: and while a more liberal policy was adopted with regard to Ireland, many fuperfluous offices were abolifhed in England by means of a reform bill, which tended powerfully to deftroy corruption. Many more important reforms would have been accomplifhed, had not the death of the diftinguifhed Rockingham brought about great and fudden changes.

Mr Fox retired in confequence of new arrangements, and Lord Shelburne, as firft lord of the treafury, made choice of Mr Pitt as chancellor of the exchequer, who declared, although only 23 years of age, that he would accept of no inferior office. Peace now feemed to be an object generally defirable at any rate, and without much regarding what facrifices might be made in order to procure it; but the terms met with powerful oppofition from two men formerly confidered as mortal enemies, viz. Lord North and Mr Fox, the latter of whom retired from office. Soon after the difmiffion of Mr Fox, Mr Pitt again brought forward the queftion refpecting a reform in parliament, which he fondly hoped would be the means of reftoring him to his wonted popularity, and pave the way to the increafe of his power. He therefore fubmitted three different motions to the confideration of the houfe; but although in thefe motions he was ably fupported, he was left in a minority.

The coalition miniftry, as it was called, had ftill a confiderable majority in parliament, notwithftanding the popularity belonging to the name and talents of Mr Pitt, but the celebrated India bill was productive of a change. This bill owed its origin to Mr Burke, but it received a regular and fyftematical oppofition from the ex-chancellor of the exchequer. It was carried, however, in the houfe of commons by a great majority, but in the houfe of lords it was oppofed by the duke of Richmond, Lord Thurlow, and Earl Temple (afterwards marquis of Buckingham); and on the 17th of December 1783, it was finally rejected by a majority of 19.

Pitt.

The king in the mean time determined on an entire change of adminiftration, and the two fecretaries were informed on the 18th of December 1783, about 12 o' clock at night, that his majefty had no further occafion for their fervices. In confequence of this change, the important offices of firft lord of the treafury and chancellor of the exchequer were beftowed on Mr Pitt, who thus became prime minifter before he was full 24 years of age. Thurlow was created lord chancellor, the duke of Richmond keeper of the privy feal; the marquis of Caermarthen and Lord Sidney were chofen fecretaries of ftate, and Mr Dundas, treafurer of the navy.

Much about this time Mr Pitt brought forward a new bill for the better government of India. He propofed that a board of controul fhould be inftituted, the nomination of whofe members was to be vefted in the crown, and to them the difpatches of the company were to be fubmitted. He alfo propofed that the appointment of the commander in chief fhould belong to his majefty, and having thus fecured the political interefts of the company, he left thofe of a commercial nature entirely to the court of directors. This bill, after a fhort debate, was rejected by a majority of eight. Such was the prefent temper of the houfe of commons, that a coalition or immediate diffolution became abfolutely neceffary; and the former having been unfuccefsfully attempted, the latter was fuddenly adopted, on the 25th of March 1784. Mr Pitt having been returned for the univerfity of Cambridge, again brought forward his bill in an amended ftate for the regulation of India, and carried it in triumph through both houfes of parliament. The remaining part of the feffion gave birth to an act for the better prevention of fmuggling, and the commutation act, by virtue of which certain duties were transferred from tea to windows.

When Mr Alderman Sawbridge (June 16th 1784) made a motion for inquiring into the prefent ftate of the commons of Great Britain in parliament, Mr Pitt, whofe political fentiments had undergone a revolution, felt himfelf confiderably embarraffed, as he was reminded that he had brought forward queftions on the fame fubject upon a former occafion. Mr Pitt, however, declined it, on account of the preffure of public bufinefs, and obferved that, in his opinion, the prefent was not the proper time for bringing forward the queftion, and that it might be urged with greater probability of fuccefs on fome future occafion. He did not wifh it to be difcuffed in a precipitate manner, yet the bufinefs itfelf fhould have every fupport he was able to afford it.

Having now attained the fummit of power and influence as prime minifter, Mr Pitt exercifed every function of his important office, without any check or controul. Poffeffed of a great majority in both houfes of parliament, as well as in the cabinet, his whole deportment in the language of his opponents, feems to have become lofty in the extreme; and he paid little or no regard to that popularity which he had formerly courted.

A commercial treaty about this time was entered into with France, the terms of which have been generally acknowledged

Pitt. acknowledged to be advantageous to Britain. Mr Pitt, who deserves great credit for giving the plan his countenance, adopted, much about the same time, another respecting the finances, from which he derived a high degree of reputation; and, as he pointed at a period when the national debt might, in all probability, be extinguished, the country, if it was not altogether satisfied, appeared to be at least contented under his administration: and it is not a little to the credit of his financial system, that his opponents, when in power, not only approved, but adopted and extended it.

In this manner a commercial country began again to flourish, by turning its attention to the arts of peace; but, during his administration, its prosperity was threatened to be interrupted by the preparations for an attack upon Russia at one time, and by an open rupture with Spain at another, relative to Nootka Sound. In both cases the blow was warded off by negociation, and a good understanding restored. The restoration of the stadtholder, by the intervention of a Prussian army, and his strenuous opposition of the prince of Wales's appointment to the regency during the king's indisposition, were also two important measures pursued and discussed in the course of his ministry.

Soon after the commencement of the French revolution, Mr Pitt deemed a war with that country inevitable. But for a full detail of the events of this war, see Britain. Having held the reins of government during 18 years, Mr Pitt, and all the members of the cabinet, suddenly retired from office in 1801. On this occasion all parties appeared to rejoice at the appointment of Mr Addington; and France, from that moment, as some assert, seemed to have neither friends nor advocates in this island. When the articles of the treaty of Amiens were debated in the house of commons, Mr Pitt defended the new minister with the whole force of his abilities and influence.

On the 15th of March 1804, Mr Pitt made a direct attack on the administration; and the admiralty board was accused by him of imbecility. He zealously supported Mr Fox's proposition relative to the Irish militia bill for the national defence, which was lost on a division. The minister's majority having dwindled to 37, on the army of reserve suspension bill, Mr Addington and some of his friends retired, and the ex-minister resumed his former seat. When parliament met on the 15th of January 1805, Mr Pitt warmly defended the war with Spain; and, on the motion for an address, he had a majority of 207.

But, in the mean time, a gouty habit, the predisposing causes of which appear to have been hereditary, and which, perhaps, was increased by his own manner of living, seized on a constitution never very strong. It is alleged, by his opponents, that this, combined with the miscarriage of his schemes, and the aspect of affairs on the continent, preyed so much upon his mind, that he is said to have died of a broken heart, at his house near Putney, between four and five on Wednesday morning, January 23. 1806, in the 47th year of his age.

As a financier, no man has obtained more praise, who ever presided at the board of exchequer. During his ministry some of our manufactures languished, but many flourished, and our exports were greatly increased. As a speaker he was unrivalled, and his generous scorn of wealth must be admired. In 20 years his debts amounted only to 40,000l. They were paid out of the public purse. The house of commons also passed a vote, that the expences of his funeral, and a monument to his memory, should be defrayed by the nation.

Pitt || Pittenweem.

PITTACUS, a native of Mitylene in Lesbos, was one of the seven wise men of Greece: his father's name was Hyrradius. With the assistance of the sons of Alcæus, he delivered his country from the oppression of the tyrant Melanchrus; and in the war which the Athenians waged against Lesbos, he appeared at the head of his countrymen, and challenged to single combat Phrynon the enemy's general. As the event of the war seemed to depend upon this combat, Pittacus had recourse to artifice; and when he engaged, he entangled his adversary in a net which he had concealed under his shield, and easily dispatched him. He was amply rewarded for this victory; and his countrymen, sensible of his merit, unanimously appointed him governor of their city with unlimited authority. In this capacity Pittacus behaved with great moderation and prudence; and after he had governed his fellow-citizens with the strictest justice, and after he had established and enforced the most salutary laws, he voluntarily resigned the sovereign power after having enjoyed it for 10 years, observing that the virtues and innocence of private life were incompatible with the power and influence of a sovereign. His disinterestedness gained him many admirers; and when the Mityleneans wished to reward his public services by presenting him with an immense tract of territory, he refused to accept more land than what should be contained in the distance to which he could throw a javelin. He died in the 70th year of his age, about 579 years before Christ, after he had spent the last 10 years of his life in literary ease and peaceful retirement.

The following maxims and precepts are ascribed to Pittacus: The first office of prudence is to foresee threatening misfortunes, and prevent them. Power discovers the man. Never talk of your schemes before they are executed; lest, if you fail to accomplish them, you be exposed to the double mortification of disappointment and ridicule. Whatever you do, do it well. Do not that to your neighbour which you would take ill from him. Be watchful for opportunities.

Many of his maxims were inscribed on the walls of Apollo's temple at Delphi, to show to the world how great an opinion the Mityleneans entertained of his abilities as a philosopher, a moralist, and a man. By one of his laws, every fault committed by a man when intoxicated deserved double punishment.

PITTENWEEM, a small town situated on the frith of Forth, towards the eastern extremity of the county of Fife in North Britain. It takes its name from a small cave in the middle of it, anciently called a *weem*; and is remarkable for nothing but the ruins of a religious house, which is sometimes called an *abbey* and sometimes a *priory*. Which of these is the proper denomination it is hardly worth while to inquire; but it appears from the arms of the monastery, still preserved over the principal gate, that the superior, by whatever title he was called, had the privilege of wearing a mitre. This edifice, which seems never to have been large, was, with other monuments of mistaken piety, alienated from the church at the Reformation; and what parts of it now remain are

Pitten-weem.

are put to very different uſes. Some of the cells of the monks furniſh habitations tolerably convenient for the ſervants of him who, in the ceaſeleſs change of property, has got poſſeſſion of the lands which formerly belonged to them. That which ſeems to have been the granary is a decent pariſh church. The porch of the chapel, the only part of that building which exiſts, has been alternately employed as a ſtable and a ſlaughter-houſe; and the meat killed there has been commonly expoſed to ſale in the lower part of the ſteeple of that edifice which is now dedicated to the offices of parochial devotion. Had the moralizing traveller*, who compoſed the beautiful and pathetic meditation on the ruins of *Jona*, condeſcended to viſit Pittenweem, he would not have viewed the abbey without emotion. Inſignificant as the place at preſent is, it ſeems to have been of ſome conſequence in the laſt century; and we are led to infer, from the following extract from the records, that the inhabitants were opulent, and that the town was fortified.

* Johnſon.

"Pittenweem, decimo quarto Feb. 1651. The bailies and council being convened, and having received information that his majeſty is to be in progreſs with his court along the coaſt to-morrow, and to ſtay at Anſtruther houſe that night, have thought it expedient, according to their bounden duty, with all reverence and due reſpect, and with all the ſame ſolemnity they can, to wait upon his majeſty, as he comes through this his majeſty's burgh, and invite his majeſty to eat and drink as he paſſes; and for that effect hath ordained, that the morn afternoon the town's colours be put upon the bertiſene of the ſteeple, and that at three o'clock the bells begin to ring, and ring on ſtill till his majeſty comes hither, and paſſes to Anſtruther: And ſicklike, that the miniſter be ſpoken to, to be with the bailies and council, who are to be in their beſt apparel, and with them a guard of 24 of the ableſt men, with partizans, and other 24 with muſkets, all in their beſt apparel, William Sutherland commanding as captain of the guard; and to wait upon his majeſty, and to receive his highneſs at the Weſt Port, bringing his majeſty and court through the town, until they come to Robert Smith's yeet, where an table is to be covered with my Lord's† beſt carpet: and that George Hetherwick have in readineſs, of fine flour, ſome great bunns, and other wheat-bread of the beſt order, baken with ſugar, cannell, and other ſpices fitting; and that James Richardſon and Walter Airth have care to have ready eight or ten gallons of good ſtrong ale, with Canary, ſack, Rheniſh wine, tent, white and claret wines, that his majeſty and his court may eat and drink; and that in the mean time, when his majeſty is preſent, the guard do diligently attend about the court; and ſo ſoon as his majeſty is to go away, that a ſign be made to Andrew Tod, who is appointed to attend the colours on the ſteeple head, to the effect he may give ſign to thoſe who attend the cannon of his majeſty's departure, and then the *haill thirty-ſix cannons to be all ſhot at once*. It is alſo thought fitting, that the miniſter, and James Richardſon the oldeſt bailie, when his majeſty comes to the table, ſhow the great joy and ſenſe this burgh has of his majeſty's condeſcendence to viſit the ſame, with ſome other expreſſions of loyalty. All which was acted." The population of this town, in 1790, was computed at 1157. N. Lat. 56. 11. W. Long. 2. 49.

† The Earl of Kelly.

Pittoſporum || Pius.

PITTOSPORUM, a genus of plants belonging to the pentandria claſs. See Botany *Index*.

PITUITARY gland. See Anatomy *Index*.

PITYOCAMPASIS, in *Entomology*, the caterpillar of the pine-tree, received its compound name from that ſubſtance. It was conſidered as a poiſon, and as a remedy, according to its different mode of application. Our chief information, concerning this caterpillar, is derived from M. Reaumur, who has attentively obſerved its manner of life. The animal cannot bear much cold, and is therefore never found in the higher latitudes. It is ſtyled proceſſionary, becauſe it never leaves its hold, where many families reſide, till the evening, when it feeds in trains, led on by two or three, and this train leaves a ribband of ſilk in its way; for thoſe behind follow exactly the ſteps of thoſe which preceded, and each leaves its fibre of ſilk. Their neſts are found in autumn; they are produced in the middle of September, become torpid in December, and recover their ſtrength again in ſpring. They then deſcend from the trees, plunge into the earth, and undergo their laſt change. It is the bombix pityocampa of Fabricius, (*Mantiſſa Inſector*. tom. ii. p. 114. N° 66.), and greatly reſembled the proceſſionary caterpillar of the oak. The ancients uſed it as a veſicatory, and the acrimony ſeems to reſide chiefly in a duſt which is concealed in receptacles on its back. This is its offenſive weapon, for it is thrown out at will, and produces very troubleſome effects, though the hair of the animal and every part of its body ſeem to have a ſimilar, but weaker power. The effect is alſo weaker in winter; but this may depend on the diminiſhed irritability of the human body, as well as on the torpid ſtate of the inſect. Their ſilk is not ſufficiently ſtrong for the loom, and in hot water melts almoſt to a paſte. In the earth it forms neſts of ſtronger ſilk, but it is then found with difficulty: in boxes its ſilk is extremely tender. Adding to all theſe inconveniences, handling the cones produces all the bad effects of the duſt. Matthiolus recommends them as a ſtyptic, and perhaps they may ſerve for burning on the ſkin inſtead of moxa, the downy ſilk of a ſpecies of artemiſia. The ancients, afraid of its hurtful qualities, uſed them with caution, and enacted laws againſt their being ſold promiſcuouſly: the modern planter is chiefly afraid of them, becauſe they deſtroy the beauty of his trees, and he endeavours to collect the eggs by cutting off the branches, which are burnt immediately.

PIVAT, or Pivot, a foot or ſhoe of iron or other metal, uſually conical or terminating in a point, whereby a body, intended to turn round, bears on another fixed at reſt, and performs its revolutions. The pivot uſually bears or turns round in a ſole, or piece of iron or braſs hollowed to receive it.

PIUS II. (Æneas-Sylvius Piccolomini), was born on the 18th of October 1405, at Corſigni in the Sieneſe, the name of which he afterwards changed into that of *Pienza*. His mother Victoria Forteguerra, when ſhe was with child of him, dreamed that ſhe ſhould be delivered of a mitred infant; and as the way of degrading clergymen at that time was by crowning them with a paper mitre, ſhe believed that Æneas would be a diſgrace to his family. But what to her had the appearance of being a diſgrace, was a preſage of the greateſt honours. Æneas was carefully educated, and made conſiderable proficiency in the belles lettres. After having

Pius. ving finished his studies at Sienna, he went in 1431 to the council of Bale with Cardinal Capranica, surnamed *De Fermo*, because he was entrusted with the government of that church. Æneas was his secretary, and was then only 26 years of age. He afterwards acted in the same capacity to some other prelates, and to Cardinal Albergati. The council of Bale honoured him with different commissions, in order to recompense him for the zeal with which he defended that assembly against Pope Eugene IV. He was afterwards secretary to Frederic III. who decreed to him the poetic crown, and sent him ambassador to Rome, Milan, Naples, Bohemia, and other places. Nicholas V. advanced him to the bishopric of Trieste, which he quitted some time after for that of Sienna. At last, after having distinguished himself in various nunciatures, he was invested with the Roman purple by Calixtus III. whom he succeeded two years after, on the 27th of August 1458. Pius II. now advanced to the holy see, made good the proverb, *Honores mutant mores.* From the commencement of his pontificate, he appeared jealous of the papal prerogatives. In 1460 he issued a bull, "declaring appeals from the pope to a council to be null, erroneous, detestable, and contrary to the sacred canons." That bull, however, did not prevent the procurator-general of the parliament of Paris from appealing to a council in defence of the Pragmatic Sanction, which the pope had strenuously opposed. Pius was then at Mantua, whither he had gone in order to engage the Catholic princes to unite in a war against the Turks. The greater part of them had agreed to furnish troops or money; others refused both, particularly France, who from that moment incurred his holiness's aversion. That aversion abated under Louis XI. whom he persuaded in 1461 to abolish the Pragmatic Sanction, which the parliament of Paris had supported with so much vigour.

The following year, 1462, was rendered famous by a controversy which took place between the Cordeliers and Dominicans, whether or not the blood of Jesus Christ was separated from his body while he lay in the grave. It was also made a question whether it was separated from his divinity. The Cordeliers affirmed that it was, but the Dominicans were of an opposite opinion. They called each other heretics; which obliged the pope to issue a bull, forbidding them under pain of censure to brand one another with such odious epithets. The bull which his holiness published on the 26th of April, retracting what he had written to the council of Bale when he was its secretary, did not redound much to his honour. "I am a man (says he), and as a man I have erred. I am far from denying that a great many things which I have said and written may deserve condemnation. Like Paul, I have preached through deception, and I have persecuted the church of God through ignorance. I imitate the blessed Augustin, who having suffered some erroneous sentiments to creep into his works, retracted them. I do the same thing: I frankly acknowledge my ignorance, from a fear lest what I have written in my younger years should be the occasion of any error that might afterwards be prejudicial to the interests of the holy see. For if it be proper for any one to defend and support the eminence and glory of the first throne of the church, it is in a peculiar manner my duty, whom God, out of his mercy and goodness alone, without any merit on my part, has raised to the dignity of *vicar of Jesus Christ.* For all these reasons, we exhort and admonish you in the Lord, not to give credit to those writings of ours which tend in any degree to hurt the authority of the apostolic see, and which establish opinions that are not received by the Roman church. If you find, then, any thing contrary to her doctrine, either in our dialogues, in our letters, or in other of our works, despise these opinions, reject them, and adopt our present sentiments. Believe me rather now that I am an old man, than when I addressed you in my earlier days. Esteem a sovereign pontiff more than a private person; except against Æneas Sylvius, but receive Pius II." It might be objected to his holiness, that it was his dignity alone which had made him alter his opinion. He anticipates that objection, by giving a short account of his life and actions, with the whole history of the council of Bale, to which he went with Cardinal Capranica in 1431; "but (says he) I was then a young man, and without any experience, like a bird just come from its nest." In the mean time, the Turks were threatening Christendom. Pius, ever zealous in the defence of religion against the infidels, forms the resolution of fitting out a fleet at the expence of the church, and of passing over into Asia himself, in order to animate the Christian princes by his example. He repaired to Ancona with a design to embark; but he there fell sick with the fatigue of the journey, and died on the 16th of August 1464, aged 59 years. Pius was one of the most learned men of his time, and one of the most zealous pontiffs; but being of an ambitious and pliant disposition, he sometimes sacrificed to that ambition. His principal works are, 1. Memoirs of the council of Bale, from the suspension of Eugenius to the election of Felix. 2. The history of the Bohemians, from their origin to the year 1458. 3. Two books on cosmography. 4. The history of Frederic III. whose vice-chancellor he had been. This performance was published in 1785 in folio, and is believed to be pretty accurate and very particular. 5. A treatise on the education of children. 6. A poem upon the passion of Jesus Christ. 7. A collection of 432 letters, printed at Milan, 1473, in folio, in which are found some curious anecdotes. 8. The memoirs of his own life, published by John Gobelin Personne his secretary, and printed at Rome in 4to in 1584. There is no doubt of this being the genuine production of that pontiff. 9. *Historia rerum ubicunque gestarum*, of which only the first part was published at Venice in 1477 in folio. His works were printed at Helmstadt in 1700, in folio, at the beginning of which we find his life. That verse of Virgil's Æneid (lib. i. 382.) which begins thus,

Sum Pius Æneas,———

and the end of the following verse,

———*fama super æthera notus,*

have been applied to him.

Pius IV. (*John Angel, Cardinal de Medicis*), of a different family from that of Florence, was born at Milan in 1499. He was son to Bernardin de Medechini, and brother of the famous Marquis de Marignan, Charles V.'s general. He raised himself by his own merit, and filled several important offices under Popes Clement VII. and Paul III. Julius III. who had entrusted him with several legations, honoured him with a cardinal's hat. Pius.

Pius.

hat in 1549. After the death of Paul IV. he was advanced to St Peter's chair on the 25th of December 1559. His predeceffor had rendered himfelf deteftable to the Romans, who treated his memory with every mark of indignity, and Pius IV. commenced his pontificate by pardoning them. He did not, however, extend the fame clemency to the nephews of Pope Paul IV.; for he caufed Cardinal Caraffe to be ftrangled in the caftle of St Angelo, and his brother, the prince de Palliano, to be beheaded. His zeal was afterwards directed againft the Turks and heretics. In order to ftop, if poffible, the progrefs of thefe laft, he renewed the Council of Trent, which had been fufpended. He knew well (fays abbé de Choify), that that council might make fome regulations which would have the effect to leffen his authority; but, on the other hand, he perceived that great inconveniences might refult from its not being affembled; and "*in the main* (faid he to his confidants) *it is better to feel evil for once than to be always in dread of it.*" In 1561 he difpatched nuncios to all the Catholic and Proteftant princes, to prefent them with the bull for calling that important affembly. An end was, however, put to it by the induftry of his nephew, S. Charles Borromeus, in 1563; and, on the 26th of January the year following, he iffued a bull for confirming its decrees. In 1565 a confpiracy was formed againft his life by Benedict Acolti, and fome other vifionaries. Thofe madmen had taken it into their head that Pius IV. was not a lawful pope, and that after his death they would place another in St Peter's chair, with the title of *Pope Angelicus*, under whom errors might be reformed, and peace reftored to the church. The confpiracy was difcovered, and the fanatic Benedict put to death. This pontiff died a little time after, on the 9th of December 1565, aged 66 years, carrying to the grave with him the hatred of the Romans, whom his feverities had exafperated. He was a man of great addrefs, and very fruitful in his refources. He adorned Rome with feveral public edifices; but thefe ornaments tended greatly to impoverifh it. If he was the inftrument of raifing his relations in the world, it muft be allowed, at leaft, that the greater part of them did him honour.

Pius V. (*S. Michael Ghifleri*), born at Bofchi or Bofco, in the diocefe of Fortona, on the 17th of January 1504, was, according to Abbé de Choify, fon to a fenator of Milan. He turned a Dominican friar. Paul IV. informed of his merit and virtue, gave him the bifhopric of Sutri, created him cardinal in 1557, and made him inquifitor-general of the faith among the Milanefe and in Lombardy; but the feverity with which he exercifed his office obliged him to quit that country. He was fent to Venice, where the ardour of his zeal met with ftill greater obftacles. Pius IV. added to the cardinal's hat the bifhopric of Mondovi. After the death of that pontiff, he was advanced to St Peter's chair in 1566. The Romans expreffed but little joy at his coronation: he was very fenfible of it, and faid, "*I hope they will be as forry at my death as they are at my election;*" but he was miftaken. Raifed by his merit to the firft ecclefiaftical preferment in Chriftendom, he could not diveft himfelf of the feverity of his character; and the fituation in which he found himfelf rendered, perhaps, that feverity neceffary. One of his firft objects was to reprefs the luxury of the clergy, the pride of the cardinals, and the licentious manners of the Romans. He caufed the decrees of reformation enacted by the Council of Trent to be put in execution; he prohibited bull-baiting in the Circus; he expelled from Rome the women of the town; and allowed the cardinals to be profecuted for their debts. The errors which overflowed the Chriftian world gave him great uneafinefs. After having employed gentle and lenient meafures in the reclaiming of heretics, he had recourfe to feverity, and fome of them ended their days in the flames of the inquifition. He particularly difplayed his zeal for the grandeur of the holy fee in 1568, by ordaining that the bull *In cœna domini*, which was publifhed at Rome every year on *Maunday Thurfday*, and which Clement XIV. fuppreffed, fhould be publifhed likewife throughout the whole church. That bull, the work of feveral fovereign pontiffs, principally regards the jurifdiction of the ecclefiaftical and civil power. It anathematizes thofe who appeal from the decrees of popes to a general council; thofe who favour the appellants; the univerfities which teach that the pope is fubject to a general council; the princes who would reftrain the ecclefiaftical jurifdiction, or who exact contributions from the clergy. It was rejected by all the fovereign ftates, excepting a very few. In 1580, fome bifhops having endeavoured to introduce it into their diocefes, the parliament caufed their temporalities to be feized upon, and declared thofe guilty of high treafon who fhould imitate the fanaticifm of thofe prelates. Pius V. for fome time meditated an expedition againft the Turks. He had the courage to make war on the Ottoman empire, by forming a league with the Venetians and Philip II. king of Spain. This was the firft time that the ftandard of the two keys was feen difplayed againft the crefcent. The naval armies came to an engagement, on the 7th of October 1571, in Lepanto bay, in which the confederate Chriftian princes obtained a fignal victory over the Turks, who loft above 30,000 men, and near 200 galleys. This fuccefs was principally owing to the pope, who exhaufted both his purfe and perfon in fitting out that armament. He died of the gravel fix months after, on the 30th of April 1572, aged 68. He repeated often, in the midft of his fufferings, "*O Lord! increafe my pains and my patience.*" His name will for ever adorn the lift of Roman pontiffs. It is true, that his bull againft Queen Elizabeth, and his other bull in favour of the inquifition, with his rigorous profecution of heretics both in France and Ireland, prove that he had more zeal than fweetnefs in his temper; but in other refpects he poffeffed the virtues of a faint and the qualities of a king. He was the model of the famous Sixtus Quintus, to whom he gave an example of amaffing in a few years fuch favings as were fufficient to make the holy fee be regarded as a formidable power. Sultan Selim, who had no greater enemy than this pope, caufed public rejoicings to be made at Conftantinople for his death during the fpace of three days. The pontificate of Pius is alfo celebrated for the condemnation of Baius, the extinction of the order of Humilies, and the reformation of that of the Ciftercians. He was canonized by Clement XI. in 1712. There are extant feveral of his letters, printed at Anvers in 1640, in 4to. Felibian, in 1672, publifhed his *Life*, tranflated from the Italian of Agatio di Somma; but we cannot vouch for the fidelity of the tranflation.

Pius.

PIX.

PIX. See *Mint-Marks*.

PIZARRO, Francis, a celebrated Spanish general, the discoverer and conqueror of Peru, in conjunction with Diego Almagro, a Spanish navigator. They are both charged with horrid cruelties to the inhabitants; and they fell victims to their own ambition, jealousy, and avarice. Almagro revolting, was defeated and beheaded by Pizarro, who was assassinated by Almagro's friends in 1541. See Peru.

PLACE, Locus, in *Philosophy*, a mode of space or that part of immoveable space which any body possesses. See Metaphysics, N° 185.

Place, in *Astronomy*. The place of the sun, a star, &c. denotes the sign and degree of the zodiac which the luminary is in; or the degree of the ecliptic, reckoning from the beginning of Aries, which the planet's or star's circle of longitude cuts: and therefore coincides with the longitude of the sun, planet, or star. As the sine of the sun's greatest declination 23° 30′ : to the sine of any present declination given or observed, for instance, 23° 15′ :: so is the radius 10 : to the sine of his longitude 81° 52′; which, if the declination were north, would give 20° 52′ of Gemini; if south, 20° 52′ of Capricorn, for the sun's place. See Declination, &c.

The place of the moon being that part of her orbit wherein she is found at any time, is of various kinds, by reason of the great inequalities of the lunar motions, which render a number of equations and reductions necessary before the just point be found. The moon's fictitious place is her place once equated; her place nearly true, is her place twice equated; and her true place thrice equated. See Astronomy, *passim*.

Place, in *War*, a general name for all kinds of fortresses where a party may defend themselves. Thus, 1. A strong or fortified place is one flanked, and covered with bastions. 2. A regular place, one whose angles, sides, bastions, and other parts, are equal; and this is usually denominated from the number of its angles, as a pentagon, hexagon, &c. 3. Irregular place is one whose sides and angles are unequal.—4. Place of arms is a strong city or town pitched upon for the chief magazine of an army; or, in a city or garrison, it is a large open spot of ground, usually near the centre of the place where the grand guard is commonly kept, and the garrison holds its rendezvous at reviews, and in cases of alarm to receive orders from the governor. 5. Places of arms of an attack, in a siege, is a spacious place covered from the enemy by a parapet or epaulement, where the soldiers are posted ready to sustain those at work in the trenches against the soldiers of the garrison. 6. Place of arms particular, in a garrison, a place near every bastion, where the soldiers sent from the grand place to the quarters assigned them relieve those that are either upon the guard or in fight. 7. Place of arms without, is a place allowed to the covert way for the planting of cannon, to oblige those who advance in their approaches to retire. 8. Place of arms in a camp, a large place at the head of the camp for the army to be ranged in and drawn up in battalia. There is also a place for each particular body, troop, or company, to assemble in.

Common-Place. See *Common-Place*.

PLACENTA, in *Anatomy* and *Midwifery*, a soft roundish mass, found in the womb of pregnant women; which, from its resemblance to the liver, was called by the ancients *hepar uterinum*, uterine liver.

PLACENTIA, called by the natives *Piacenza*, is a town of Italy, and capital of a duchy of the same name, with a bishop's see. It is seated about 100 paces from the river Po, in a very fertile pleasant plain, watered by a great number of rivulets, and surrounded with hills, abounding in all sorts of fruits. In its territory there are salt-springs, from which they make a very white salt; and there are also mines of iron, woods, and warrens. It contains a great number of merchants, and is reckoned three miles in circumference. Its fortifications are inconsiderable, but the citadel is pretty strong. The streets are straight, and the principal street called *Stradone*, is 25 common paces broad and 3000 feet long, in a direct line, with 600 stone posts, for separating the foot from the carriage-way, and on both sides are 11 spacious convents. The other buildings of the city are not very remarkable, though it contains 45 churches, 28 convents, and two alms-houses. The cathedral is pretty much in the Gothic taste; but the church of the Augustines is reckoned the most beautiful, and esteemed worthy of its architect, the celebrated Vignoli. The ducal palace, though large, makes no great appearance externally; but within there are some good apartments. In the area before the town-house stand two admirable brass statues of Alexander and Renatus IV. both of the house of Farnese, and dukes of Parma and Placentia. The bishop is suffragan to the archbishop of Milan. At this city begins the Via Æmilia, which extends as far as Rimini on the Adriatic. The number of the inhabitants is about 30,000, among whom there are 2000 ecclesiastics. This city has been taken several times in the wars of Italy. The king of Sardinia took possession of it in 1744, it being ceded to him by the queen of Hungary; but it was taken from him in 1746, after a bloody battle. The French got possession of it in 1796. It has a famous university, and the inhabitants are much esteemed for their politeness. There is a great fair here every year on the 15th of April, which is much frequented. Placentia is about 32 miles north-west of Parma and 83 east of Turin. E. Long. 10. 24. N. Lat. 45. 5.

PLAGIARY, in *Philology*, the purloining another man's works, and putting them off as our own. Among the Romans, *plagiarius* was properly a person who bought, sold, or retained a freeman for a slave; and was so called, because, by the Flavian law, such persons were condemned *ad plagas*, "to be whipped."

Thomasius has an express treatise *De plagio literario*; wherein he lays down the laws and measures of the right which authors have to one another's writings.—"Dictionary writers, at least such as meddle with *arts and sciences* (as is pertinently observed by Mr Chambers), seem exempted from the common laws of *meum* and *tuum*: they do not pretend to set up on their own bottom, nor to treat you at their own cost. Their works are supposed, in great measure, compositions of other peoples; and what they take from others, they do it avowedly, and in the open sun.—In effect, their quality gives them a title to every thing that may be for their purpose, wherever they find it; and if they rob, they do not do it any otherwise than as the bee does, for the public service. Their occupation is not pillaging, but collecting contributions; and, if you ask them their authority, they will produce you the practice of their predecessors of all ages and nations."

Plagium, Plague.

PLAGIUM, in *Law*. See KIDNAPPING.

PLAGUE, PESTILENCE, or *Peſtilential Fever*, is a very acute, malignant, and contagious diſeaſe; being a putrid fever of the worſt kind, and ſeldom failing to prove mortal. Though it is generally defined a malignant fever, Diemerbroeck thinks they ought to be diſtinguiſhed, ſince the fever is not the eſſence of the diſeaſe, but merely a ſymptom or effect of it. See MEDICINE, N° 221.

The plague, as is generally agreed, is never bred or propagated in Britain, but always imported from abroad, eſpecially from the Levant, Leſſer Aſia, Egypt, &c. where it is very common. Sydenham has remarked that it rarely infeſts this country oftener than once in 40 years, and happily we have been free of it for a much longer period.

Authors are not as yet agreed concerning the nature of this dreadful diſtemper. Some think that inſects are the cauſe of it, in the ſame way that they are the cauſe of blights, being brought in ſwarms from other climates by the wind, when they are taken into the lungs in reſpiration; the conſequence of which is, that they mix with the blood and juices, and attack and corrode the viſcera. Mr Boyle, on the other hand, thinks it originates from the effluvia or exhalations breathed into the atmoſphere from noxious minerals, to which may be added ſtagnant waters and putrid bodies of every kind.

Mr Gibbon thinks that the plague is derived from damp, hot, and ſtagnating air, and the putrefaction of animal ſubſtances, eſpecially locuſts. See *Gibbon's Roman Hiſtory*, 4to edit. vol. iv. p. 327—332, where there is alſo a very particular account of the plague which depopulated the earth in the time of the emperor Juſtinian.

The Mahometans believe that the plague proceeds from certain ſpirits, or goblins, armed with bows and arrows, ſent by God to puniſh men for their ſins; and that when the wounds are given by ſpectres of a black colour, they certainly prove fatal, but not ſo when the arrows are ſhot by thoſe that appear white. They therefore take no precaution to guard themſelves againſt it. The wiſer profeſſors of this religion, however, at preſent act otherwiſe; for we find a receipt recommended by Sidy Mohammed Zerroke, one of the moſt celebrated Marabouts, prefaced with theſe remarkable words: "The lives of us all are in the hands of God, when it is we muſt die. However, it hath pleaſed him to ſave many perſons from the plague, by taking every morning while the infection rages, one pill or two of the following compoſition; viz. of myrrh two parts, ſaffron one part, of aloes two parts, of ſyrup of myrtle berries, *q. ſ.*" But this remedy is confined to the more enlightened; for the bigotry of the lower ſort is ſo extreme as to make them deſpiſe all precautions which people of other nations uſe. Of this extreme and fooliſh prejudice Dr Chandler gives an intereſting account when ſpeaking of the plague at Smyrna. This learned author is of opinion that the diſeaſe ariſes from animalcules, which he ſuppoſes to be inviſible. See *Chandler's Travels in Aſia Minor*, p. 279, &c.

Plague.

It is a remarkable fact, that *plagues* are ſometimes partial, and that they only attack particular animals, or a particular deſcription of perſons, avoiding others altogether, or attacking them but ſlightly. Thus Fernelius informs us of a plague, or murrain, in 1514, which invaded only cats. Dionyſius Halicarnaſſeus mentions a plague which attacked none but maids; and that which raged in the time of Gentilis, killed ſcarcely any women, and very few but luſty men. Boterus mentions another plague, which aſſaulted none but the younger ſort; and we have inſtances of the ſame kind of a later ſtanding (A). Cardan ſpeaks of a plague at Baſil, with which the Switzers were infected, and the Italians, Germans, or French, exempted: and John Utenhovius takes notice of a dreadful one at Copenhagen, which, though it raged among the Danes, ſpared the Germans, Dutch, and Engliſh, who went with all freedom, and without the leaſt danger, to the houſes of the infected. During the plague which ravaged Syria in 1760, it was obſerved that people of the ſoundeſt conſtitutions were the moſt liable to it, and that the weak and delicate were either ſpared or eaſily cured. It was moſt fatal to the Moors; and, when it attacked them, it was generally incurable.

When the plague raged in Holland in 1636, a young girl was ſeized with it, had three carbuncles, and was removed to a garden, where her lover, who was betrothed to her, attended her as a nurſe, and ſlept with her as his wife. He remained uninfected, and ſhe recovered, and was married to him. The ſtory is related by Vinc. Fabricius in the *Miſc. Cur. Ann. II. Obſ.* 188.

Many methods have been adopted in different countries to prevent the importation of this dreadful ſcourge of the human race, and to ſtop the progreſs of infection after it has been imported. In England, mayors, bailiffs, head officers of corporations, and juſtices of peace, have power to tax inhabitants, houſes, and lands, &c. within their precincts, for the relief of perſons infected with the plague; and juſtices of the county may tax perſons within five miles round, on a pariſh's inability; the tax to be levied by diſtreſs and ſale of goods, or in default thereof by impriſonment. Infected perſons going abroad, after being commanded to keep houſe for avoiding farther infections, may be reſiſted by watchmen, &c. and puniſhed as vagrants, if they have no ſores upon them; and if they have infectious ſores on them it is felony. Juſtices of the peace, &c. are to appoint ſearchers, examiners, and buriers of the dead, in places infected, and adminiſter oaths to them for the performance of their duties, &c. *ſtat.* 1 *Jac. I. cap.* 31. See QUARANTINE.

The commiſſion at Moſcow having, in the year 1770, invented a fumigation-powder, which, from ſeveral leſſer experiments, had proved efficacious in preventing the infection of the plague; in order more fully to aſcertain its virtue in that reſpect, it was determined,

(A) See account of the *yellow fever* under the article PHILADELPHIA, where it appears that the diſeaſe was leſs fatal to ſome ſorts of perſons than to others.

Plague. termined, towards the end of the year, that ten malefactors under sentence of death should, without undergoing any other precautions than the fumigations, be confined three weeks in a lazaretto, be laid upon the beds, and dressed in the clothes, which had been used by persons sick, dying, and even dead, of the plague in the hospital. The experiment was accordingly tried, and none of the ten malefactors were then infected, or have been since ill. The fumigation powder is prepared as follows.

Powder of the first strength.] Take leaves of juniper, juniper-berries pounded, ears of wheat, guaiacum wood pounded, of each six pounds; common saltpetre pounded, eight pounds; sulphur pounded, six pounds; Smyrna tar, or myrrh, two pounds: mix all the above ingredients together, which will produce a pood of the powder of fumigation of the first strength. [*N. B.* A pood is 40 pounds Russian, which are equal to 35 pounds and a half or 36 pounds English avoirdupoise.]

Powder of the second strength.] Take southernwood cut into small pieces, four pounds; juniper-berries pounded, three pounds; common saltpetre pounded, four pounds; sulphur pounded, two pounds and a half; Smyrna tar, or myrrh, one pound and a half: mix the above together, which will produce half a pood of the powder of fumigation of the second strength.

Odoriferous powder.] Take the root called *kalmus* cut into small pieces, three pounds; leaves of juniper cut into small pieces, four pounds; frankincense pounded grossly, one pound; storax pounded, and rose flowers, half a pound; yellow amber pounded, one pound; common saltpetre pounded, one pound and a half; sulphur, a quarter of a pound: mix all the above together, which will produce nine pounds and three quarters of the odoriferous powder.

Remark on the powder of fumigation.] If guaiacum cannot be had, the cones of pines or firs may be used in its stead; likewise common tar of pines and firs may be used instead of the Smyrna tar, or myrrh, and mugwort may supply the place of southernwood.

Thucydides, who was himself infected, lib ii. gives us an account of a dreadful plague which happened at Athens, about the year before Christ 430, while the Peloponnesians under the command of Archidamus wasted all their territory abroad; but of these two enemies the plague was by far the most dreadful and severe.

The most dreadful plague that ever raged at Rome was in the reign of Titus, A. D. 80. The emperor left no remedy unattempted to abate the malignity of the distemper, acting during its continuance like a father to his people. The same fatal disease raged in all the provinces of the Roman empire in the reign of M. Aurelius, A. D. 167, and was followed by a dreadful famine, by earthquakes, inundations, and other calamities. The Romans believed that Æsculapius sometimes entered into a serpent, and cured the plague.

About the year 430 the plague visited Britain, just after the Picts and Scots had made a formidable invasion of the southern part of the island. The plague raged with uncommon fury, and swept away most of those whom the sword and famine had spared, so that the living were scarcely sufficient to bury the dead.

About the year 1348 the plague became almost general over Europe. A great many authors give an account of this plague, which is said to have appeared first in the kingdom of Kathay in the year 1346, and to have proceeded gradually westward to Constantinople and Egypt. From Constantinople it passed into Greece, Italy, France, and Africa, and by degrees along the coasts of the ocean into Britain and Ireland, and afterwards into Germany, Hungary, Poland, Denmark and the other northern kingdoms. According to Antoninus archbishop of Florence the distemper carried off 60,000 people in that city, among whom was the historian John Villani.

In the year 1656 the plague was brought from Sardinia to Naples, being introduced into the city by a transport with soldiers on board. It raged with excessive violence, carrying off in less than six months 400,000 of the inhabitants. The distemper was at first called by the physicians a malignant fever; but one of them affirming it to be pestilential, the viceroy, who was apprehensive lest such a report would occasion all communication with Naples to be broke off, was offended with this declaration, and ordered him to be imprisoned. As a favour, however, he allowed him to return and die in his own house. By this proceeding of the viceroy, the distemper being neglected, made a most rapid and furious progress, and filled the whole city with consternation. The streets were crowded with confused processions, which served to spread the infection through all the quarters. The terror of the people increased their superstition; and it being reported that a certain nun had prophesied that the pestilence would cease upon building a hermitage for her sister nuns upon the hill of St Martin's, the edifice was immediately begun with the most ardent zeal. Persons of the highest quality strove who should perform the meanest offices; some loading themselves with beams, and others carrying baskets full of lime and nails, while persons of all ranks stripped themselves of their most valuable effects, which they threw into empty hogsheads placed in the streets to receive the charitable contributions. Their violent agitation, however, and the increasing heats, diffused the malady through the whole city, and the streets and the stairs of the churches were filled with the dead; the number of whom, for some time of the month of July, amounted daily to 15,000.

The viceroy now used all possible precautions to abate the fury of the distemper, and to prevent its spreading to the provinces. The infection, however, desolated the whole kingdom, excepting the provinces of Otranto and the Farther Calabria, and the cities of Gaeta, Sorrento, Paolo, and Belvidere. The general calamity was increased in Naples by malecontents, who insinuated that the distemper had been designedly introduced by the Spaniards, and that there were people in disguise who went through the city sowing poisoned dust. This idle rumour enraged the populace, who began to insult the Spanish soldiers, and threaten a sedition; so that the viceroy, to pacify the mob, caused a criminal to be broke upon the wheel, under pretence that he was a disperser of the dust. A violent and plentiful rain falling about the middle of August, the distemper began to abate; and on the eighth of December the physicians made a solemn declaration that the city was entirely free from infection.

Of the dreadful plague which raged at London in the

the year 1665, the reader will find an account in the article LONDON, N° 21. In 1720 the city of Marseilles was visited with this destructive disease, brought in a ship from the Levant; and in seven months, during which time it continued, it carried off not less than 60,000 people. This desolation is not yet obliterated from the minds of the inhabitants; some survivors remained alive but a few years ago to transmit a traditional account of it to after ages. There are two fine pictures, painted by Puget, representing some of the horrid scenes of that time. "They are (says Lady Craven) only too well executed. I saw several dying figures taking leave of their friends, and looking their last anxious, kind, and wishful prayers on their sick infants, that made the tears flow down my cheeks. I was told the physicians and noblemen who were assisting the sick and dying, were all portraits: I can easily conceive it; for in some faces there is a look of reflection and concern which could only be drawn from the life." *Letters*, p. 34, 35. This fatal event has caused the laws of quarantine to be very strictly enforced in the lazaretto here, which is an extensive insulated building.

The ravages of this disease have been dreadful wherever it has made its appearance. On the first arrival of the Europeans at the island of Gran Canaria, it contained 14,000 fighting men, soon after which, two thirds of the whole inhabitants fell a sacrifice to the plague, which had doubtless been introduced by their new visitors. The destruction it has made in Turkey in Europe, and particularly in Constantinople, must be known to every reader; and its fatal effects have been particularly heightened there by that firm belief which prevails among the people of predestination, &c. as has been already mentioned. It is generally brought into European Turkey from Egypt; where it is very frequent, especially at *Grand CAIRO*. To give even a list of all the plagues which have desolated many flourishing countries, would extend this article beyond all bounds; and minutely to describe them all, would be impossible. For the plague at Smyrna, we refer to Chandler's Travels as above. Respecting that which raged in Syria in 1760, we refer to the Abbé Mariti's Travels through Cyprus, Syria, and Palestine, vol. i. p. 278—296. This plague was one of the most malignant and fatal that Syria ever experienced; for it scarcely made its appearance in any part of the body when it carried off the patient.

In addition to what the reader will find upon this subject in the article MEDICINE, and the observations which have now been offered, we beg leave to state the sentiments of Berthier on this subject, in his account of Bonaparte's expedition into Syria.

"At the time of our entry into Syria (says he), all the towns were infected by the plague; a malady which ignorance and barbarity render so fatal in the east. Those who are affected by it give themselves up for dead; they are immediately abandoned by every body, and are left to die, when they might have been saved by medicine and attention.

"Citizen Degenettes, principal physician to the army, displayed a courage and character which entitle him to the national gratitude. When our soldiers were attacked by the least fever, it was supposed that they had caught the plague, and these maladies were confounded. The fever hospitals were abandoned by the officers of health and their attendants. Citizen Degenettes repaired in person to the hospitals, visited all the patients, felt the glandular swellings, dressed them, declared and maintained that the distemper was not the plague, but a malignant fever with glandular swellings, which might easily be cured by attention, and keeping the patient's mind easy."

The views of Degenettes in making this distinction were worthy of the highest commendation; but Dr Moseley maintains that this fever was actually the plague. The physician, however, carried his courage so far, as to make two incisions, and to inoculate the suppurated matter from one of these buboes above his breast, and under his armpits, but was not affected with the malady. He thus eased the minds of the soldiers, the first step to a cure; and, by his assiduity and constant attendance in the hospitals, a number of men attacked with the plague were cured. His example was followed by other officers of health. "There are, says Dr Moseley, annual or seasonal disorders, more or less severe, in all countries; but the plague, and other great depopulating epidemics, do not always obey the seasons of the year. Like comets, their course is eccentric. They have their revolutions; but from whence they come, or whither they go after they have made their revolution, no mortal can tell.

"Diseases originating in the atmosphere seize some, and pass by others; and act exclusively on bodies graduated to receive their impressions; otherwise whole nations would be destroyed. In some constitutions of the body the access is easy, in some difficult, and in others impossible.

"The air of confined places may be so vitiated as to be unfit for the purposes of the healthy existence of any person. Hence gaol, hospital, and ship fevers. But, as these distempers are the offspring of a local cause, that local cause, and not the distempered people, communicate the disease.

"The infection, were it not in the atmosphere, would be confined within very narrow limits; have a determinate sphere of action; and none but physicians and attendants on the sick would suffer; and these must suffer; and the cause and the effects would be palpable to our senses. Upon this ground, the precaution of quarantine would be rational. But who then would visit and attend the sick, or could live in hospitals, prisons, and lazarettos?"

The author is convinced from these reasonings, that the bubo and carbuncle, of which we hear so much in Turkey, and read so much in our own history of plagues, arise from heating food and improper treatment; that they contain no infection; and consequently that they are not the natural deposit of the morbific virus separated from the contagion.

Speaking of the plague, Mr Brown says, "the first symptoms are said to be thirst; 2. Cephalalgia; 3. A stiff and uneasy sensation, with redness and tumour about the eyes; 4. Watering of the eyes; 5. White pustules on the tongue. Not uncommonly, all these have successively shown themselves, yet the patient has recovered; in which case, where suppuration has had place, the skin always remains discoloured, commonly of a purple hue. Many who have been bled in an early stage of the disorder, have recovered without any fatal symptoms;

symptoms; but whether from that or any other cause, does not appear certain."

Oil rubbed into the skin acts as a preventive, as well as a cure of the plague. When the operation is performed to prevent infection, it is successfully performed with that view at Smyrna, as often as the plague makes its appearance in the city. As it is not done for the purpose of promoting perspiration, it is not requisite that it should be performed with the same speed as when for curing the disorder; nor is it necessary to abstain from flesh, and to use soups; but it will be proper to use only fowls or veal for some days, without any seasoning. It will in fine be necessary to guard against indigestible food, and such liquors as might put in motion or inflame the mass of the blood.

This interesting discovery merits the attention of all medical men; for if olive oil has been found efficacious in curing or preserving against one species of infection, it is not absurd to suppose that the same or other kinds of oil might be productive of much benefit in other malignant infectious diseases. We hope soon to hear of some trial being made with it in this country. Would it be of any service in the yellow fever, so prevalent in the western world?

PLAIN, or PLANE, in general, an appellation given to whatever is smooth and even, or simple, obvious, and easy to be understood; and, consequently, stands opposed to rough, enriched, or laboured.

A plain figure, in geometry, is an uniform surface; from every point of whose perimeter right lines may be drawn to every other point in the same.

A plain angle is one contained under two lines, or surfaces, in contradistinction to a solid angle. See ANGLE under GEOMETRY.

The doctrine of plain triangles, as those included under three right lines, is termed *plain trigonometry*. See the article TRIGONOMETRY.

PLAIN Chart. See the article CHART.

PLAIN-Sailing. See NAVIGATION.

PLAISE, the English name of a species of pleuronectes. See PLEURONECTES, ICHTHYOLOGY *Index*.

PLAN, in general, denotes the representation of something drawn on a plane; such are maps, charts, ichnographies, &c. See MAP, CHART, &c.

The term *plan*, however, is particularly used for a draught of a building, such as it appears, or is intended to appear, on the ground, showing the extent, division, and distribution of its area or ground-plot into apartments, rooms, passages, &c.

A geometrical plan is that wherein the solid and vacant parts are represented in their natural proportions.

The raised plan of a building is the same with what is otherwise called an *elevation* or *orthography*. See ORTHOGRAPHY.

A perspective plan is that exhibited by degradations or diminutions, according to the rules of perspective. See PERSPECTIVE.

To render plans intelligible, it is usual to distinguish the massives with a black wash; the projectures on the ground are drawn in full lines, and those supposed over them in dotted lines. The augmentations or alterations to be made are distinguished by a colour different from what is already built; and the tints of each plan made lighter as the stories are raised.

In large buildings it is usual to have three several plans for the three first stories.

PLANCUS, FRANCIS, doctor of physic, was born at Amiens in 1696, and died on the 19th of September 1765, aged 69 years. He is the author of some works which have had considerable reputation. 1. A complete System of Surgery, in 2 vols in 12mo; a treatise much recommended by surgeons to their pupils. 2. A choice Library of Medicine, taken from periodical publications, both French and others: this curious collection, continued and completed by M. Goulin, makes 9 vols in 4to, or 18 vols in 12mo. 3. A Translation of Vander Wiel's Observations on Medicine and Surgery, 1758, 2 vols in 12mo. Plancus was also the editor of various editions of works on medicine and surgery, which he enriched with notes.

PLANE, in *Geometry*, denotes a plain surface, or one that lies evenly between its bounding lines: and as a right line is the shortest extension from one point to another, so a plane surface is the shortest extension from one line to another.

In astronomy, conics, &c. the term *plane* is frequently used for an imaginary surface, supposed to cut and pass through solid bodies; and on this foundation is the whole doctrine of conic sections built. See ASTRONOMY, CONIC *Sections*, &c.

In mechanics, planes are either horizontal, that is, parallel to the horizon, or inclined thereto. See MECHANICS.

The determining how far any given plane deviates from an horizontal line, makes the whole business of levelling. See the article LEVELLING.

In optics, the planes of reflection and refraction are those drawn through the incident and reflected or refracted rays. See OPTICS.

In perspective we meet with the perspective plane, which is supposed to be pellucid, and perpendicular to the horizon; the horizontal plane, supposed to pass through the spectator's eye, parallel to the horizon; the geometrical plane, likewise parallel to the horizon, wherein the object to be represented is supposed to be placed, &c. See PERSPECTIVE.

The plane of projection in the stereographic projection of the sphere, is that on which the projection is made, corresponding to the perspective plane. See PROJECTION.

PLANE, in joinery, an edged tool or instrument for paring and shaving of wood smooth. It consists of a piece of wood very smooth at bottom, as a stock or shaft; in the midst of which is an aperture, through which a steel edge, or chissel, placed obliquely, passes; which, being very sharp, takes off the inequalities of the wood along which it slides.

PLANE-Tree, in *Botany*. See PLATANUS.

PLANET, a celestial body, revolving round the sun as a centre, and continually changing its position with respect to the fixed stars; whence the name *planet*, which is a Greek word, signifying "wanderer."

The planets are usually distinguished into primary and secondary. The primary ones, called by way of eminence *planets*, are those which revolve round the sun as a centre; and the secondary planets, more usually called *satellites* or *moons*, are those which revolve round a primary planet as a centre, and constantly attend it in its revolution round the sun.

The

The primary planets are again diftinguifhed into fuperior and inferior. The fuperior planets are thofe farther from the fun than our earth; as Mars, Jupiter, Saturn, and the Georgium Sidus; and the inferior planets are thofe nearer the fun than our earth, as Venus and Mercury. For an account of the planets lately difcovered, fee VESTA.

That the planets are opaque bodies, like our earth, is thought probable for the following reafons. 1. Since in Venus, Mercury, and Mars, only that part of the difk illuminated by the fun is found to fhine; and again, Venus and Mercury, when between the earth and the fun, appear like dark fpots or maculæ on the fun's difk; it is evident, that Mars, Venus, and Mercury, are opaque bodies, illuminated with the borrowed light of the fun. And the fame appears of Jupiter, from its being void of light in that part to which the fhadow of the fatellites reaches, as well as in that part turned from the fun; and that his fatellites are opaque, and reflect the fun's light, is abundantly fhown. Again, fince Saturn, with his ring and fatellites, only yield a faint light, fainter confiderably than that of the fixed ftars, though thefe be vaftly more remote, and than that of the reft of the planets; it is paft doubt that he too with his attendants are opaque bodies. 2. Since the fun's light is not tranfmitted through Mercury and Venus, when placed againft him, it is plain they are denfe opaque bodies; which is likewife evident of Jupiter, from his hiding the fatellites in his fhadow; and therefore, by analogy, the fame may be concluded of Saturn. 3. From the variable fpots of Venus, Mars, and Jupiter, it is evident thefe planets have a changeable atmofphere; which changeable atmofphere may, by a like argument, be inferred of the fatellites of Jupiter; and therefore, by fimilitude, the fame may be concluded of the other planets. 4. In like manner, from the mountains obferved in Venus, the fame may be fuppofed in the other planets. 5. Since, then, Saturn, Jupiter, and the fatellites of both, Mars, Venus, and Mercury, are opaque bodies fhining with the fun's borrowed light, are furnifhed with mountains, and encompaffed with a changeable atmofphere; they have, it is concluded, waters, feas, &c. as well as dry land, and are bodies like the moon, and therefore like the earth. And hence it feems alfo highly probable, that the other planets have their animal inhabitants as well as our earth.

PLANETARIUM, an aftronomical machine, fo called from its reprefenting the motions, orbits, &c. of the planets, agreeable to the Copernican fyftem. See ASTRONOMY.

PLANETARY, fomething that relates to the planets. Hence we fay, planetary worlds, planetary inhabitants, &c. See PLANET.

PLANETARY Syftem, is the fyftem or affemblage of the planets, primary and fecondary, moving in their refpective orbits, round their common centre the fun. See ASTRONOMY.

PLANETARY Days.—Among the ancients, the week was fhared among the feven planets, each planet having its day. This we learn from Dion Caffius and Plutarch *Sympof.* l. 4. q. 7. Herodotus adds, that it was th Egyptians who firft difcovered what god, that is, wha planet, prefides over each day; for that among this peo ple the planets were directors. And hence it is, that in moft European languages the days of the week are ftill denominated from the planets; Sunday, Monday, &c. See WEEK.

PLANETARY Years, the periods of time in which the feveral planets make their revolutions round the fun or earth.—As from the proper revolution of the fun, the folar year takes its original; fo from the proper revolutions of the reft of the planets about the earth, fo many forts of years do arife, viz. the Saturnian year, which is defined by 29 Egyptian years, 174 hours, 58 minutes, equivalent in a round number to 30 folar years. The Jovial year, containing 317 days, 14 hours, 59 minutes. —The Martial year, containing 321 days, 23 hours, 31 minutes. For Venus and Mercury, as their years, when judged of with regard to the earth, are almoft equal to the folar year; they are more ufually eftimated from the fun, the true centre of their motions: in which cafe, the former is equal to 224 days, 16 hours, 40 minutes; the latter to 87 days, 23 hours, 14 minutes.

PLANIMETRY, that part of geometry which confiders lines and plain figures, without confidering their height or depth. See GEOMETRY.

PLANISPHERE, fignifies a projection of the fphere, and its various circles, on a plane; in which fenfe, maps, whereon are exhibited the meridians and other circles of the fphere, are planifpheres. See MAP.

PLANT is defined to be an organical body, deftitute of fenfe and fpontaneous motion, adhering to another body in fuch a manner as to draw from it its nourifhment, and having a power of propagating itfelf by feeds.

The vegetation and economy of plants is one of thofe fubjects in which our knowledge is extremely circumfcribed. A total inattention to the ftructure and economy of plants is the chief reafon of the fmall progrefs that has been made in the principles of vegetation, and of the inftability and fluctuation of our theories concerning it; for which reafon we fhall give a fhort defcription of the ftructure of plants, beginning with the feed, and tracing its progrefs and evolution to a ftate of maturity.

1. *Of Seeds.*] The feeds of plants are of various figures and fizes. Moft of them are divided into two lobes; though fome, as thofe of the crefs-kind, have fix; and others, as the grains of corn, are not divided, but entire.

But as the effential properties of all feeds are the fame, when confidered with regard to the principles of vegetation, our particular defcriptions fhall be limited to one feed, viz. the great garden-bean. Neither is the choice of this feed altogether arbitrary; for, after it begins to vegetate, its parts are more confpicuous than many others, and confequently better calculated for inveftigation.

This feed is covered with two coats or membranes. The outer coat is extremely thin, and full of pores; but may be eafily feparated from the inner one (which is much thicker), after the bean has been boiled, or lain a few days in the foil. At the thick end of the bean there is a fmall hole vifible to the naked eye, immediately over the radicle or future root, that it may have a free paffage into the foil (fig. 1. A). When thefe coats are taken off, the body of the feed appears, which is divided Plate CCCCXX.

Plant.

ed into two smooth portions or lobes. The smoothness of the lobes is owing to a thin film or cuticle with which they are covered.

At the basis of the bean is placed the radicle or future root (fig. 3. A). The trunk of the radicle, just as it enters into the body of the seed, divides into two capital branches, one of which is inserted into each lobe, and sends off smaller ones in all directions through the whole substance of the lobes (fig. 4. AA). These ramifications become so extremely minute towards the edges of the lobes, that they require the finest glasses to render them visible. To these ramifications Grew and Malpighi have given the name of *seminal root*; because, by means of it, the radicle and plume, before they are expanded, derive their principal nourishment.

The plume, bud, or germ (fig. 3.), is inclosed in two small corresponding cavities in each lobe. Its colour and consistence is much the same with those of the radicle, of which it is only a continuation, but having a quite contrary direction; for the radicle descends into the earth, and divides into a great number of smaller branches or filaments; but the plume ascends into the open air, and unfolds itself into all the beautiful variety of stem, branches, leaves, flower, fruit, &c. The plume in corn shoots from the smaller end of the grain, and amongst maltsters goes by the name of *acrospire*.

The next thing to be taken notice of is the substance or parenchymatous part of the lobes. This is not a mere concreted juice, but is curiously organized, and consists of a vast number of small bladders resembling those in the pith of trees (fig. 5.).

Besides the coats, cuticle, and parenchymatous parts, there is a substance perfectly distinct from these, distributed in different proportions through the radicle, plume, and lobes. This inner substance appears very plainly in a transverse section of the radicle or plume. Towards the extremity of the radicle it is one entire trunk; but higher up it divides into three branches; the middle one runs directly up to the plume, and the other two pass into the lobes on each side, and spread out into a great variety of small branches through the whole body of the lobes (fig. 4.). This substance is very properly termed the *seminal root*: for when the seed is sown, the moisture is first absorbed by the outer coats, which are everywhere furnished with sap and air-vessels; from these it is conveyed to the cuticle; from the cuticle it proceeds to the pulpy part of the lobes; when it has got thus far, it is taken up by the mouths of the small branches of the seminal root, and passes from one branch into another, till it is all collected into the main trunk, which communicates both with the plume and radicle, the two principal involved organs of the future plant. After this the sap or vegetable food runs in two opposite directions: part of it ascends into the plume, and promotes the growth and expansion of that organ; and part of it descends into the radicle, for nourishing and evolving the root and its various filaments. Thus the plume and radicle continue their progress in opposite directions till the plant arrives at maturity.

It is here worth remarking, that every plant is really possessed of two roots, both of which are contained in the seed. The plume and radicle, when the seed is first deposited in the earth, derive their nourishment from the seminal root; but, afterwards, when the radicle begins to shoot out its filaments, and to absorb some moisture, not, however, in a sufficient quantity to supply the exigencies of the plume, the two lobes, or main body of the seed, rise along with the plume, assume the appearance of two leaves, resembling the lobes of the seed in size and shape, but having no resemblance to those of the plume, for which reason they have got the name of *dissimilar leaves*.

These dissimilar leaves defend the young plume from the injuries of the weather, and at the same time, by absorbing dew, air, &c. assist the tender radicle in nourishing the plume, with which they have still a connection by means of the seminal root above described. But when the radicle or second root has descended deep enough into the earth, and has acquired a sufficient number of filaments or branches for absorbing as much aliment as is proper for the growth of the plume; then the seminal or dissimilar leaves, their utility being entirely superseded, begin to decay and fall off.

Fig. 1. A, the foramen or hole in the bean through which the radicle shoots into the soil. Plate CCCCXX. fig. 1.

Fig. 2. A transverse section of the bean; the dots being the branches of the seminal root. Fig. 2.

Fig. 3. A, the radicle. B, the plume or bud. Fig. 3.

Fig. 4. A view of the seminal root branched out upon the lobes. Fig. 4.

Fig. 5. A longitudinal section of one of the lobes of the bean a little magnified, to show the small bladders of which the pulpy or parenchymatous part is composed. Fig. 5.

Figs. 6. 7. A, a transverse section of the radicle. B, a transverse section of the plume, showing the organs or vessels of the seminal root. Fig. 6. 7.

Fig. 8. The appearance of the radicle, plume, and seminal root, when a little further advanced in growth. Fig. 8.

Having thus briefly described the seed, and traced its evolution into three principal organic parts, viz. the plume, radicle, and seminal leaves, we shall next take an anatomical view of the root, trunk, leaves, &c.

2. *Of the root.*] In examining the root of plants, the first thing that presents itself is the skin, which is of various colours in different plants. Every root, after it has arrived at a certain age, has a double skin. The first is coeval with the other parts, and exists in the seed: but afterwards there is a ring sent off from the bark, and forms a second skin; *e. g.* in the root of the dandelion, towards the end of May, the original or outer skin appears shrivelled, and is easily separated from the new one, which is fresher, and adheres more firmly to the bark. Perennial plants are supplied in this manner with a new skin every year; the outer one always falls off in the autumn and winter, and a new one is formed from the bark in the succeeding spring. The skin has numerous cells or vessels, and is a continuation of the parenchymatous part of the radicle. However, it does not consist solely of parenchyma; for the microscope shows that there are many tubular ligneous vessels interspersed through it.

When the skin is removed, the true cortical substance or bark appears, which is also a continuation of the parenchymatous part of the radicle, but greatly augmented. The bark is of very different sizes. In most trees it is exceeding thin in proportion to the wood and pith. On the other hand, in carrots, it is almost one-half of the semidiameter of the root; and, in dandelion, it is nearly twice as thick as the woody part.

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The bark is compofed of two fubftances; the parenchyma or pulp, which is the principal part, and a few woody fibres. The parenchyma is exceedingly porous, and has a great refemblance to a fponge; for it fhrivels confiderably when dried, and dilates to its former dimenfions when infufed in water. Thefe pores or veffels are not pervious, fo as to communicate with each other; but confift of diftinct little cells or bladders, fcarcely vifible without the affiftance of the microfcope. In all roots, thefe cells are conftantly filled with a thin watery liquor. They are generally of a fpherical figure; though in fome roots, as the buglofs and dandelion, they are oblong. In many roots, as the horfe-radifh, peony, afparagus, potato, &c. the parenchyma is of one uniform ftructure. But in others it is more diverfified, and puts on the fhape of rays, running from the centre towards the circumference of the bark. Thefe rays fometimes run quite through the bark, as in lovage; and fometimes advance towards the middle of it, as in melilot and moft of the leguminous and umbelliferous plants. Thefe rays generally ftand at an equal diftance from each other in the fame plant; but the diftance varies greatly in different plants. Neither are they of equal fizes: in carrot they are exceedingly fmall, and fcarcely difcernible; in melilot and chervil, they are thicker. They are likewife more numerous in fome plants than in others. Sometimes they are of the fame thicknefs from one edge of the bark to the other; and fome grow wider as they approach to the fkin. The veffels with which thefe rays are amply furnifhed, are fuppofed to be air-veffels, becaufe they are always found to be dry, and not fo tranfparent as the veffels which evidently contain the fap.

In all roots there are ligneous veffels difperfed in different proportions through the parenchyma of the bark. Thefe ligneous veffels run longitudinally through the bark in the form of fmall threads, which are tubular, as is evident from the rifing of the fap in them when a root is cut tranfverfely. Thefe ligneous fap-veffels do not run in direct lines through the bark, but at fmall diftances incline towards one another, in fuch a manner that they appear to the naked eye to be inofculated; but the microfcope difcovers them to be only contiguous, and braced together by the parenchyma. Thefe braces or coarctations are very various both in fize and number in different roots; but in all plants they are moft numerous towards the inner edge of the bark. Neither are thefe veffels fingle tubes; but, like the nerves in animals, are bundles of 20 or 30 fmall contiguous cylindrical tubes, which uniformly run from the extremity of the root, without fending off any branches or fuffering any change in their fize or fhape.

In fome roots, as parfnep, efpecially in the ring next the inner extremity of the bark, thefe veffels contain a kind of lymph, which is fweeter than the fap contained in the bladders of the parenchyma. From this circumftance they have got the name of *lymph-ducts*.

Thefe lymph-ducts fometimes yield a mucilaginous lymph, as in the comfrey; and fometimes a white milky glutinous lymph, as in the angelica, fonchus, burdock, fcorzonera, dandelion, &c. The lymph-ducts are fuppofed to be the veffels from which the gums and balfams are fecerned. The lymph of fennel, when expofed to the air, becomes a clear tranfparent balfam; and that of the fcorzonera, dandelion, &c. condenfes into a gum.

Plant.

The fituation of the veffels is various. In fome plants they ftand in a ring or circle at the inner edge of the bark, as in afparagus; in others, they appear in lines or rays, as in borage; in the parfnep, and feveral other plants, they are moft confpicuous towards the outer edge of the bark; and in the dandelion, they are difpofed in the form of concentric circles.

The wood of roots is that part which appears after the bark is taken off, and is firmer and lefs porous than the bark or pith. It confifts of two diftinct fubftances, viz. the pulpy or parenchymatous, and the ligneous. The wood is connected to the bark by large portions of the bark inferted into it. Thefe infertions are moftly in the form of rays, tending to the centre of the pith, which are eafily difcernible by the eye in a tranfverfe fection of moft roots. Thefe infertions, like the bark, confift of many veffels, moftly of a round or oval figure.

The ligneous veffels are generally difpofed in collateral rows running longitudinally through the root. Some of thefe contain air, and others fap. The *air-veffels* are fo called, becaufe they contain no liquor. Thefe air-veffels are diftinguifhed by being whiter than the others.

The pith is the centrical part of the root. Some roots have no pith, as the ftramonium, nicotiana, &c.; others have little or none at the extremities of the roots, but have a confiderable quantity of it near the top. The pith, like every other part of a plant, is derived from the feed; but in fome it is more immediately derived from the bark: for the infertions of the bark running in betwixt the rays of the wood, meet in the centre, and conftitute the pith. It is owing to this circumftance, that, among roots which have no pith in their lower parts, they are amply provided with it towards the top, as in columbine, lovage, &c.

The bladders of the pith are of very different fizes, and generally of a circular figure. Their pofition is more uniform than in the bark. Their fides are not mere films, but a compofition of fmall fibres or threads; which gives the pith, when viewed with a microfcope, the appearance of a piece of fine gauze or net-work.

We fhall conclude the defcription of roots with obferving, that their whole fubftance is nothing but a congeries of tubes and fibres, adapted by nature for the abforption of nourifhment, and of courfe the extenfion and augmentation of their parts.

Fig. 9. A tranfverfe fection of the root of wormwood as it appears to the naked eye. Plate CCCCXX. fig. 9.

Fig. 10. A fection of fig. 9. magnified. AA, the fkin, with its veffels. BBBB, the bark. The round holes CCC, &c. are the lymph-ducts of the bark: All the other holes are little cells and fap-veffels. DDD, parenchymatous infertions from the bark, with the cells, &c. EEEE, the rays of the wood, in which the holes are the air-veffels. *N. B.* This root has no pith. Fig. 10.

5. *Of the Trunk, Stalk,* or *Stem.*] In defcribing the trunks of plants, it is neceffary to premife, that whatever is faid with regard to them applies equally to the branches.

The trunk, like the root, confifts of three parts, viz. the bark, wood, and pith. Thefe parts, though fubftantially the fame in the trunk as in the root, are in many cafes very different in their texture and appearance.

The

ANATOMY of PLANTS. *PLATE CCCCXX.*

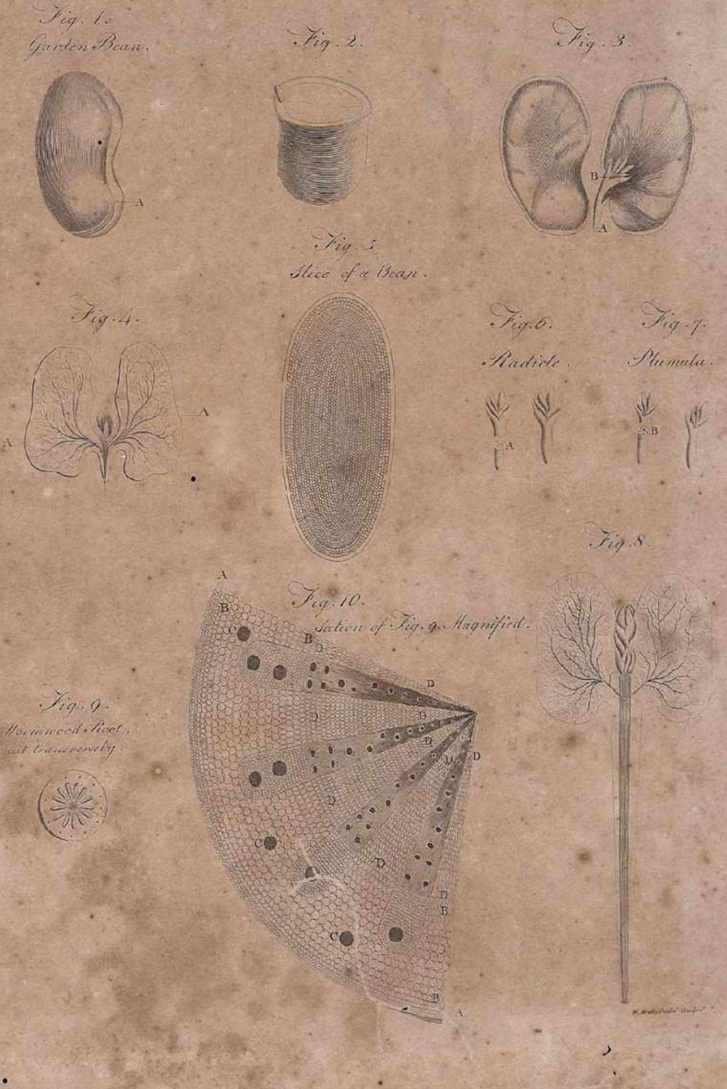

Fig. 12.
Transverse Section of the Ash Branch Magnified.

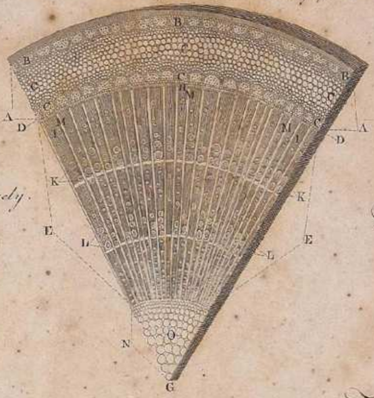

Fig. 11.
Ash Branch cut transversely.

Fig. 14.

Fig. 15.

Fig. 13.
Vine Leaf.

Fig. 17.
Tulip Root.

Fig. 18.
Pear cut transversely.

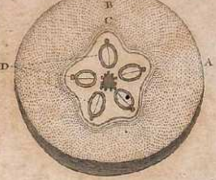

Fig. 19.
piece cut off fig. 18.

Fig. 21.
Pear cut Longitudinally.

Fig. 20.
Fig. 19. magnified.

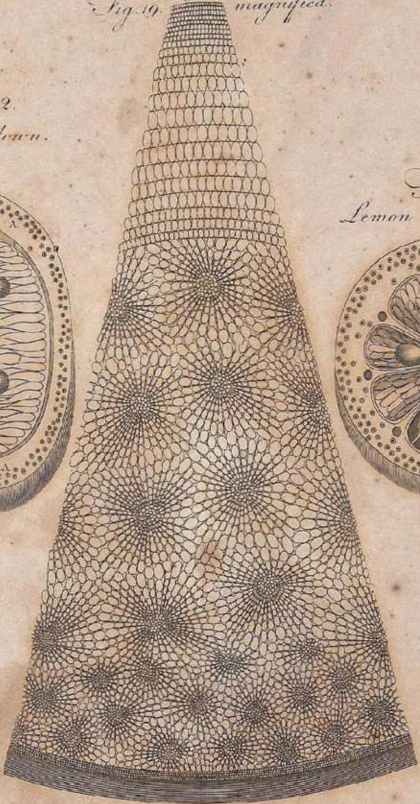

Fig. 22.
Lemon cut down.

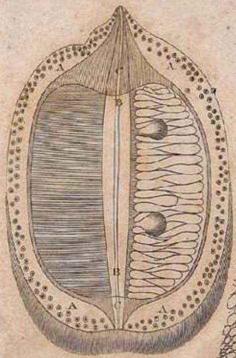

Fig. 23.
Lemon cut transversely.

W. Archibald sculpt.

Plant.

The skin of the bark is composed of very minute bladders, interspersed with longitudinal woody fibres, as in the nettle, thistle, and most herbs. The outside of the skin is visibly porous in some plants, particularly the cane.

The principal body of the bark is composed of pulp or parenchyma, and innumerable vessels much larger than those of the skin. The texture of the pulpy part, though the same substance with the parenchyma in roots, yet seldom appears in the form of rays running towards the pith; and when these rays do appear, they do not extend above half-way to the circumference. The vessels of the bark are very differently situated, and destined for various purposes in different plants. For example, in the bark of the pine, the innermost are lymph-ducts, and exceedingly small; the outermost are gum or resiniferous vessels, destined for the secretion of turpentine; and are so large as to be distinctly visible to the naked eye.

The wood lies between the bark and pith, and consists of two parts, viz. a parenchymatous and a ligneous. In all trees, the parenchymatous part of the wood, though much diversified as to size and consistence, is uniformly disposed in diametrical rays, or insertions running betwixt similar rays of the ligneous part.

The true wood is nothing but a congeries of old dried lymph-ducts. Between the bark and the wood a new ring of these ducts is formed every year, which gradually loses its softness as the cold season approaches, and towards the middle of winter is condensed into a solid ring of wood. These annual rings, which are distinctly visible in most trees when cut through, serve as natural marks to distinguish their age (fig. 11, 12.). The rings of one year are sometimes larger, sometimes less, than those of another, probably owing to the favourableness or unfavourableness of the season.

The pith, though of a different texture, is exactly of the same substance with the parenchyma of the bark, and the insertions of the wood. The quantity of pith is various in different plants. Instead of being increased every year like the wood, it is annually diminished, its vessels drying up, and assuming the appearance and structure of wood; insomuch that in old trees there is scarce such a thing as pith to be discerned.

A ring of sap-vessels is usually placed at the outer edge of the pith, next the wood. In the pine, fig, and walnut, they are very large. The parenchyma of the pith is composed of small cells or bladders, of the same kind with those of the bark, only of a larger size. The general figure of these bladders is circular; though in some plants, as the thistle and borage, they are angular. Though the pith is originally one connected chain of bladders, yet as the plant grows old they shrivel, and open in different directions. In the walnut, after a certain age, it appears in the form of a regular transverse hollow division. In some plants it is altogether wanting; in others, as the sonchus, nettle, &c. there is only a transverse partition of it at every joint. Many other varieties might be mentioned; but these must be left to the observation of the reader.

Plate CCCCXXI. fig. 11. Fig. 11. A transverse section of a branch of ash, as it appears to the eye.

Fig. 12. Fig. 12. The same section magnified. AA, the bark. BBB. an arched ring of sap-vessels next the skin. CCC, the parenchyma of the bark with its cells, and another arched ring of sap-vessels. DD, a circular line of lymph-ducts immediately below the above arched ring. EE, the wood. F, the first year's growth. G, the second. H, the third year's growth. III, the true wood. KK, the great air-vessels. LL, the lesser ones. MMM, the parenchymatous insertions of the bark represented by the white rays. NO, the pith, with its bladders or cells.

4. *Of the Leaves.*] The leaves of plants consist of the same substance with that of the trunk. They are full of nerves or woody portions, running in all directions, and branching out into innumerable small threads, interwoven with the parenchyma like fine lace or gauze.

The skin of the leaf, like that of an animal, is full of pores, which both serve for perspiration and for the absorption of dews, air, &c. These pores or orifices differ both in shape and magnitude in different plants, which is the cause of that variety of texture or grain peculiar to every plant.

The pulpy or parenchymatous part consists of very minute fibres, wound up into small cells or bladders. These cells are of various sizes in the same leaf.

All leaves, of whatever figure, have a marginal fibre, by which all the rest are bounded. The particular shape of this fibre determines the figure of the leaf.

The vessels of leaves have the appearance of inosculating; but, when examined by the microscope, they are found only to be interwoven or laid along each other.

What are called *air-vessels*, or those which carry no sap, are visible even to the naked eye in some leaves. When a leaf is slowly broken, they appear like small woolly fibres, connected to both ends of the broken piece.

Fig. 13. The appearance of the air-vessels to the eye, in a vine leaf drawn gently asunder. Plate CCCCXXI. fig. 13.

Fig. 14. A small piece cut off that leaf. Fig. 14.

Fig. 15. The same piece magnified, in which the vessels have the appearance of a screw. Fig. 15.

Fig. 16. The appearance of these vessels as they exist in the leaf before they are stretched out. Fig. 16.

5. *Of the Flower.*] It is needless here to mention any thing of the texture, or of the vessels, &c. of flowers, as they are pretty similar to those of the leaf. It would be foreign to our present purpose to take any notice of the characters and distinctions of flowers. These belong to the science of BOTANY, to which the reader is referred.

There is one curious fact, however, which must not be omitted, viz. That every flower is perfectly formed in its parts many months before it appears outwardly; that is, the flowers which appear this year are not properly speaking the flowers of this year, but of the last. For example, mezereon generally flowers in January; but these flowers were completely formed in the month of August preceding. Of this fact any one may satisfy himself by separating the coats of a tulip-root about the beginning of September; and he will find that the two innermost form a kind of cell, in the centre of which stands the young flower, which is not to make its appearance till the following April or May. Fig. 17. exhibits a view of the tulip-root when dissected in September, with the young flower towards the bottom. Fig. 17.

6. *Of the Fruit.*] In describing the structure of fruits, a

Plant. a few examples ſhall be taken from ſuch as are moſt generally known.

A *pear*, beſides the ſkin, which is a production of the ſkin of the bark, conſiſts of a double parenchyma or pulp, ſap, and air-veſſels, calculary and acetary.

The outer parenchyma is the ſame ſubſtance continued from the bark, only its bladders are larger and more ſucculent.

It is everywhere interſperſed with ſmall globules or grains, and the bladders reſpect theſe grains as a kind of centres, every grain being the centre of a number of bladders. The ſap and air-veſſels in this pulp are extremely ſmall.

Next the core is the inner pulp or parenchyma, which conſiſts of bladders of the ſame kind with the outer, only larger and more oblong, correſponding to thoſe of the pulp, from which it ſeems to be derived. This inner pulp is much ſourer than the other, and has none of the ſmall grains interſperſed through it; and hence it has got the name of *acetary*.

Between the acetary and outer pulp, the globules or grains begin to grow larger, and gradually unite into a hard ſtony body, eſpecially towards the corculum or ſtool of the fruit; and from this circumſtance it has been called the *calculary*.

Theſe grains are not derived from any of the organical parts of the tree; but ſeem rather to be a kind of concretions precipitated from the ſap, ſimilar to the precipitation from wine, urine, and other liquors.

The core is a roundiſh cavity in the centre of the pear, lined with a hard woody membrane, in which the ſeed is incloſed. At the bottom of the core there is a ſmall duct or canal, which runs up to the top of the pear; this canal allows the air to get into the core, for the purpoſe of drying and ripening the ſeeds.

Fig. 18. Fig. 18. a tranſverſe ſection of a pear, as it appears to the naked eye. A, the ſkin, and a ring of ſap-veſſels. B, the outer parenchyma, or pulp, with its veſſels, and ligneous fibres interſperſed. C, the inner parenchyma, or acetary, with its veſſels, which are larger than the outer one. D, the core and ſeeds.

Fig. 19. Fig. 19. a piece cut off, fig. 19.

Fig. 20. Fig. 20. is fig. 19. magnified. A A A, the ſmall grains, or globules, with the veſſels radiated from them.

Fig. 21. Fig. 21. a longitudinal ſection of the pear, ſhowing a different view of the ſame parts with thoſe of fig. 18. A the channel, or duct, which runs from the top of the pear to the bottom of the core.

In a *lemon*, the parenchyma appears in three different forms. The parenchyma of the rind is of a coarſe texture, being compoſed of thick fibres, woven into large bladders. Thoſe neareſt the ſurface contain the eſſential oil of the fruit, which burſts into a flame when the ſkin is ſqueezed over a candle. From this outmoſt parenchyma nine or ten inſertions or lamellæ are produced, which run between as many portions of the pulp, and unite into one body in the centre of the fruit, which correſponds to the pith in trunks or roots. At the bottom and top of the lemon, this pith evidently joins with the rind, without the intervention of any lamellæ. This circumſtance ſhows, that the pith and bark are actually connected in the trunk and roots of plants, though it is difficult to demonſtrate the connection, on account of the cloſeneſs of their texture, and the minuteneſs of their fibres. Many veſſels are diſperſed through the whole of this parenchyma; but the largeſt ones ſtand on the inner edge of the rind, and the outer edge of the pith, juſt at the two extremities of each lamella. Plant.

The ſecond kind of parenchyma is placed between the rind and the pith; is divided into diſtinct bodies by the lamellæ; and each of theſe bodies forms a large bag.

Theſe bags contain a third parenchyma, which is a cluſter of ſmaller bags, diſtinct and unconnected with each other, having a ſmall ſtalk by which they are fixed to the large bag. Within each of theſe ſmall bags are many hundreds of bladders, compoſed of extremely minute fibres. Theſe bladders contain the acid juice of the lemon.

Fig. 22. a longitudinal ſection of a lemon. A A A, the rind with the veſſels which contain the eſſential oil. B B, the ſubſtance correſponding to the pith, formed by the union of the lamellæ or inſertions. C C, its continuation and connection with the rind, independent of the inſertions. Fig. 22.

Fig. 23. a tranſverſe ſection of the lemon. B B B, &c. the nine pulpy bags, or ſecond parenchyma, placed between the rind and the pith; and the cluſter of ſmall bags, which contain the acid juice, incloſed in the large ones. C C, the large veſſels that ſurround the pith. D D, two of the large bags laid open, ſhowing the ſeeds, and their connection with the lamellæ or membranes which form the large bags. Fig. 23.

Of the Perſpiration of PLANTS, *and the quantity of moiſture daily imbibed by them.*—Theſe curious particulars have been determined with great accuracy by Dr Hales. The method he took to accompliſh his purpoſe was as follows.—In the month of July, commonly the warmeſt ſeaſon of the year, he took a large ſun-flower three feet and a half high, which had been purpoſely planted in a flower-pot when young. He covered the pot with thin milled lead, leaving only a ſmall hole to preſerve a communication with the external air, and another by which he might occaſionally ſupply the plant with water. Into the former he inſerted a glaſs tube nine inches long, and another ſhorter tube into the hole by which he poured in the water; and the latter was kept cloſe ſtopped with a cork, except when there was occaſion to uſe it. The holes in the bottom of the pot were alſo ſtopped up with corks, and all the crevices ſhut with cement.—Things being thus prepared, the pot and plant were weighed for 15 ſeveral days; after which the plant was cut off cloſe to the leaden plate, and the ſtump well covered with cement. By weighing, he found that there perſpired through the unglazed porous pot two ounces every 12 hours; which being allowed for in the daily weighing of the plant and pot, the greateſt perſpiration, in a warm day, was found to be one pound 14 ounces; the middle rate of perſpiration, one pound four ounces; the perſpiration of a dry warm night, without any ſenſible dew, was about three ounces; but when there was any ſenſible though ſmall dew, the perſpiration was nothing; and when there was a large dew, or ſome little rain in the night, the plant and pot was increaſed in weight two or three ounces.

In order to know what quantity was perſpired from a ſquare inch of ſurface, our author cut off all the leaves of the plant, and laid them in five ſeveral parcels, according to their ſeveral ſizes; and then meaſured the ſurface of a leaf of each parcel, by laying over it a large

lattice

Plant. lattice made with threads, in which each of the little squares was $\frac{1}{4}$ of an inch; by numbering of which, he had the furface of the leaves in fquare inches; which, multiplied by the number of leaves in the correfponding parcels, gave the area of all the leaves. By this method he found the furface of the whole plant above ground to be 5616 fquare inches, or 39 fquare feet. He dug up another fun-flower of nearly the fame fize, which had eight main roots, reaching 15 inches deep and fidewife, from the ftem. It had befides a very thick bufh of lateral roots from the eight main roots, extending every way in a hemifphere about nine inches from the ftem and main roots. In order to eftimate the length of all the roots, he took one of the main roots with its laterals, and meafured and weighed them; and then weighed the other feven with their laterals; by which means he found the fum of all their lengths to be 1448 feet. Suppofing then the periphery of thefe roots at a medium to be 0.131 of an inch, then their furface will be 2276 fquare inches, or 15.8 fquare feet; that is, equal to 0.4 of the furface of the plant above ground. From calculations drawn from thefe obfervations, it appears, that a fquare inch of the upper furface of this plant perfpires $\frac{1}{165}$ part of an inch in a day and a night; and that a fquare inch of the furface underground imbibed $\frac{1}{67}$ of an inch in the fame time.

The quantity perfpired by different plants, however, is by no means equal. A vine-leaf perfpires only $\frac{1}{191}$ of an inch in 12 hours; a cabbage perfpires $\frac{1}{80}$ of an inch in the fame time; an apple-tree $\frac{1}{102}$ in 12 hours; and a lemon $\frac{1}{248}$ in 12 hours.

Of the circulation of the Sap in PLANTS.—Concerning this there have been great difputes; fome maintaining, that the vegetable fap has a circulation analogous to the blood of animals; while others affirm, that it only afcends in the day-time, and defcends again in the night. In favour of the doctrine of circulation it has been urged, that upon making a tranfverfe incifion into the trunk of a tree, the juice which runs out proceeds in greater quantity from the upper than the lower part; and the fwelling in the upper lip is alfo much greater than in the lower. It appears, however, that when two fimilar incifions are made, one near the top and the other near the root, the latter expends much more fap than the former. Hence it is concluded, that the juice afcends by one fet of veffels and defcends by another. But, in order to fhow this clearly, it would be neceffary firft to prove that there is in plants, as in animals, fome kind of centre from which the circulation begins, and to which it returns; but no fuch centre has been difcovered by any naturalift; neither is there the leaft provifion apparently made by nature whereby the fap might be prevented from defcending in the very fame veffels through which it afcends. In the lacteal veffels of animals, which we may fuppofe to be analogous to the roots of vegetables, there are valves which effectually prevent the chyle when once abforbed from returning into the inteftines; but no fuch thing is obferved in the veffels of vegetables; whence it muft be very probable, that when the propelling force ceafes, the juice defcends by the very fame veffels through which it afcended.—This matter, however, has been cleared up almoft as well as the nature of the fubject will admit of by the experiments of Dr Hales †. Thefe experiments are fo numerous, that for a particular account of them we muft refer to the work itfelf; however, his reafoning againft the circulation of the fap will be fufficiently intelligible without them. "We fee (fays he), in many of the foregoing experiments, what quantities of moifture trees daily imbibe and perfpire: now the celerity of the fap muft be very great, if that quantity of moifture muft, moft of it, afcend to the top of the tree, then defcend, and afcend again, before it is carried off by perfpiration.

"The defect of a circulation in vegetables feems in fome meafure to be fupplied by the much greater quantity of liquor, which the vegetable takes in, than the animal, whereby its motion is accelerated; for we find the funflower, bulk for bulk, imbibes and perfpires 17 times more frefh liquor than a man, every 24 hours.

"Befides, Nature's great aim in vegetables being only that the vegetable life be carried on and maintained, there was no occafion to give its fap the rapid motion which was neceffary for the blood of animals.

"In animals, it is the heart which fets the blood in motion, and makes it continually circulate; but in vegetables we can difcover no other caufe of the fap's motion but the ftrong attraction of the capillary fapveffels, affifted by the brifk undulations and vibrations caufed by the fun's warmth, whereby the fap is carried up to the top of the talleft trees, and is there perfpired off through the leaves: but when the furface of the tree is greatly diminifhed by the lofs of its leaves, then alfo the perfpiration and motion of the fap is proportionably diminifhed, as is plain from many of the foregoing experiments: fo that the afcending velocity of the fap is principally accelerated by the plentiful perfpiration of the leaves, thereby making room for the fine capillary veffels to exert their vaftly attracting power, which perfpiration is effected by the brifk rarefying vibrations of warmth; a power that does not feem to be any ways well adapted to make the fap defcend from the tops of vegetables by different veffels to the root.

"If the fap circulated, it muft needs have been feen defcending from the upper part of large gafhes cut in branches fet in water, and with columns of water preffing on their bottoms in long glafs tubes. In both which cafes it is certain that great quantities of water paffed through the ftem, fo that it muft needs have been feen defcending, if the return of the fap downwards were by trufion or pulfion, whereby the blood in animals is returned through the veins to the heart; and that pulfion if there were any, muft neceffarily be exerted with prodigious force, to be able to drive the fap through the finer capillaries. So that, if there be a return of the fap downwards, it muft be by attraction, and that a very powerful one, as we may fee by many of thefe experiments. But it is hard to conceive what and where that power is which can be equivalent to that provifion nature has made for the afcent of the fap in confequence of the great perfpiration of the leaves.

"The inftances of the jeffamine-tree, and of the paffion-tree, have been looked upon as ftrong proofs of the circulation of the fap, becaufe their branches, which were far below the inoculated bud, were gilded: but we have many vifible proofs in the vine, and other bleeding trees, of the fap's receding back, and pufhing forwards alternately, at different times of the day and night. And there is great reafon to think that the fap of all other trees, has fuch an alternate, receding, and progreffive motion, occafioned by the alternacies of day and night, warm and cool, moift and dry.

† *Vegetable Statics*, vol. i. p. 141.

Plant.

"For the sap in all vegetables does probably recede in some measure from the tops of the branches, as the sun leaves them; because its rarefying power then ceasing, the greatly rarefied sap, and air mixed with it, will condense, and take up less room than they did, and the dew and rain will then be strongly imbibed by the leaves; whereby the body and branches of the vegetable which have been much exhausted by the great evaporation of the day, may at night imbibe sap and dew from the leaves; for by several experiments, plants were found to increase considerably in weight, in dewy and moist nights. And by other experiments on the vine, it was found that the trunk and branches of vines were always in an imbibing state, caused by the great perspiration of the leaves, except in the bleeding season; but when at night that perspiring power ceases, then the contrary imbibing power will prevail, and draw the sap and dew from the leaves, as well as moisture from the roots.

"And we have a farther proof of this by fixing mercurial gages to the stems of several trees which do not bleed, whereby it is found that they are always in a strongly imbibing state, by drawing up the mercury several inches: whence it is easy to conceive, how some of the particles of the gilded bud in the inoculated jessamine may be absorbed by it, and thereby communicate their gilding miasma to the sap of other branches; especially when, some months after the inoculation, the stock of the inoculated jessamine is cut off a little above the bud; whereby the stock, which was the counteracting part to the stem, being taken away, the stem attracts more vigorously from the bud.

"Another argument for the circulation of the sap is, that some sorts of the graffs will infect and canker the stocks they are grafted on: but by mercurial gages fixed to fresh-cut stems of trees, it is evident that those stems were in a strongly imbibing state; and consequently the cankered stocks might very likely draw sap from the graff, as well as the graff alternately from the stock; just in the same manner as leaves and branches do from each other, in the vicissitudes of day and night. And this imbibing power of the stock is so great, where only some of the branches of a tree are grafted, that the remaining branches of the stock will, by their strong attraction, starve those graffs; for which reason it is usual to cut off the greatest part of the branches of the stock, leaving only a few small ones to draw up the sap.

"The instance of the ilex grafted upon the English oak, seems to afford a very considerable argument against a circulation. For, if there were a free uniform circulation of the sap through the oak and ilex, why should the leaves of the oak fall in winter, and not those of the ilex?

"Another argument against an uniform circulation of the sap in trees, as in animals, may be drawn from an experiment, where it was found by the three mercurial gages fixed to the same vine, that while some of its branches changed their state of protruding sap into a state of imbibing, others continued protruding sap; one nine, and the other thirteen days longer."

To this reasoning of Dr Hales we shall subjoin an experiment made by Mr Mustel of the Academy of Sciences at Rouen, which seems decisive against the doctrine of circulation. His account of it is as follows.—"On the 12th of January I placed several shrubs in pots against the windows of my hot-house, some within the house and others without it. Through holes made for this purpose in the panes of glass, I passed a branch of each of the shrubs, so that those in the inside had a branch without, and those on the outside one within; after this, I took care that the holes should be exactly closed and luted. This inverse experiment, I thought, if followed closely, could not fail affording sufficient points of comparison, to trace out the differences, by the observation of the effects.

"The 20th of January, a week after this disposition, all the branches that were in the hot-house began to disclose their buds. In the beginning of February there appeared leaves; and towards the end of it, shoots of a considerable length, which presented the young flowers. A dwarf apple-tree, and several rose-trees, being submitted to the same experiment, showed the same appearance then as they commonly put on in May; in short, all the branches which were within the hot-house, and consequently kept in the warm air, were green at the end of February, and had their shoots in great forwardness. Very different were those parts of the same tree which were without and exposed to the cold. None of these gave the least sign of vegetation; and the frost, which was intense at that time, broke a rose-pot placed on the outside, and killed some of the branches of that very tree which, on the inside, was every day putting forth more and more shoots, leaves, and buds, so that it was in full vegetation on one side, whilst frozen on the other.

"The continuance of the frost occasioned no change in any of the internal branches. They all continued in a very brisk and verdant state, as if they did not belong to the tree which, on the outside, appeared in the state of the greatest suffering. On the 15th of March, notwithstanding the severity of the season, all was in full bloom. The apple-tree had its root, its stem, and part of its branches, in the hot-house. These branches were covered with leaves and flowers; but the branches of the same tree, which were carried on the outside, and exposed to the cold air, did not in the least partake of the activity of the rest, but were absolutely in the same state which all trees are in during winter. A rose-tree, in the same position, showed long shoots with leaves and buds; it had even shot a vigorous branch upon its stalk; whilst a branch which passed through to the outside had not begun to produce any thing, but was in the same state with other rose-trees left in the ground. This branch is four lines in diameter, and 18 inches high.

"The rose-tree on the outside was in the same state; but one of its branches drawn through to the inside of the hot-house was covered with leaves and rose-buds. It was not without astonishment that I saw this branch shoot as briskly as the rose-tree which was in the hot-house, whose roots and stalk, exposed as they were to the warm air, ought, it should seem, to have made it get forwarder than a branch belonging to a tree, whose roots, trunk, and all its other branches, were at the very time frost-nipped. Notwithstanding this, the branch did not seem affected by the state of its trunk; but the action of the heat upon it produced the same effect as if the whole tree had been in the hot-house."

Of the Perpendicularity of PLANTS.—This is a curious phenomenon in natural history, which was first observed by M. Dodart, and published in an essay on the affectation

Memoires de l'Acad. Royal des Sciences, an. 1708.

affectation of perpendicularity obſerved in the ſtems or ſtalks of all plants, in the roots of many, and even in their branches, as much as poſſible. Though almoſt all plants riſe a little crooked, yet the ſtems ſhoot up perpendicularly, and the roots ſink down perpendicularly: even thoſe, which by the declivity of the ſoil come out inclined, or thoſe which are diverted out of the perpendicular by any violent means, again redreſs and ſtraighten themſelves and recover their perpendicularity, by making a ſecond and contrary bend or elbow without rectifying the firſt. We commonly look upon this affectation without any ſurpriſe; but the naturaliſt who knows what a plant is, and how it is formed, finds it a ſubject of aſtoniſhment.

Each ſeed we know contains in it a little plant, already formed, and needing nothing but to be unfolded; the little plant has its root; and the pulp, which is uſually ſeparated into two lobes, is the foundation of the firſt food it draws by its root when it begins to germinate. If a ſeed in the earth, therefore, be diſpoſed ſo as that the root of the little plant be turned downwards, and the ſtem upwards, and even perpendicularly upwards, it is eaſy to conceive that the little plant coming to unfold itſelf, its ſtalk and root need only follow the direction they have to grow perpendicularly. But we know that the ſeeds of plants, whether ſown of themſelves or by man, fall in the ground at random; and among the great variety of ſituations with regard to the ſtalk of their plant, the perpendicular one upwards is but one. In all the reſt, therefore, it is neceſſary that the ſtalk rectify itſelf, ſo as to get out of the ground: but what force effects this change, which is unqueſtionably a violent action? Does the ſtalk find a leſs load of earth above it, and therefore go naturally that way where it finds the leaſt obſtacle? Were this ſo, the little root, when it happens to be uppermoſt, muſt alſo follow that direction, and mount up.

To account for two ſuch different actions, M. Dodart ſuppoſes that the fibres of the ſtalks are of ſuch a nature as to be contracted and ſhortened by the heat of the ſun, and lengthened out by the moiſture of the earth; and, on the contrary, that the fibres of the roots are contracted by the moiſture of the earth, and lengthened by the heat of the ſun. When the plantule therefore is inverted, and the root at the top, the fibres which compoſe one of the branches of the root are not alike expoſed to the moiſture of the earth, the lower part being more expoſed than the upper. The lower muſt of courſe contract the moſt; and this contraction is again promoted by the lengthening of the upper, whereon the ſun acts with the greateſt force. This branch of the root muſt therefore recoil towards the earth, and, inſinuating through the pores thereof, muſt get underneath the bulb, &c. By inverting this reaſoning we diſcover how the ſtalk comes to get uppermoſt.

We ſuppoſe then that the earth attracts the root to itſelf, and that the ſun contributes to its deſcent; and, on the other hand, that the ſun attracts the ſtem, and the earth contributes to ſend it towards the ſame. With reſpect to the ſtraightening of the ſtalks in the open air, our author imagines that it ariſes from the impreſſion of external cauſes, particularly the ſun and rain. For the upper part of a ſtalk that is bent is more expoſed to the rain, dew, and even the ſun, &c. than the under; and theſe cauſes, in a certain ſtructure of the fibres, both equally tend to ſtraighten the part moſt expoſed by the ſhortening they ſucceſſively occaſion in it; for moiſture ſhortens by ſwelling and heat by diſſipating. What that ſtructure is which gives the fibres ſuch different qualities, or whereon it depends, is a myſtery as yet beyond our depth.

M. de la Hire accounts for the perpendicularity of the ſtems or ſtalks of plants in this manner: he ſuppoſes that the root of plants draws a coarſer and heavier juice, and the ſtem and branches a finer and more volatile one. Moſt naturaliſts indeed conceive the root to be the ſtomach of the plant, where the juices of the earth are ſubtilized ſo as to become able to riſe through the ſtem to the extremity of the branches. This difference of juices ſuppoſes larger pores in the roots than the ſtalk, &c. and, in a word, a different contexture. This difference muſt be found even in the little inviſible plant incloſed in the ſeed: in it, therefore, we may conceive a point of ſeparation; ſuch as, that all on one ſide, for example the root, ſhall be unfolded by the groſſer juices, and all on the other ſide by the more ſubtile ones. Suppoſe the plantule, when its parts begin to unfold, to be entirely inverted, the root at the top, and the ſtalk below; the juices entering the root will be coarſeſt, and when they have opened and enlarged the pores ſo as to admit juices of a determinate weight, thoſe juices preſſing the root more and more will drive it downwards; and this will increaſe as the root is more extended or enlarged: for the point of ſeparation being conceived as the fixed point of a lever, they will act by the longer arm. The volatile juices at the ſame time having penetrated the ſtalk, will give it a direction from below upwards; and, by reaſon of the lever, will give it more and more every day. The little plant is thus turned on its fixed point of ſeparation till it become perfectly erect.

When the plant is thus erected, the ſtalk ſhould ſtill riſe perpendicularly, in order to give it the more firm biding, and enable it to withſtand the effort of wind and weather. M. Parent thus accounts for this effect: If the nutritious juice which arrived at the extremity of a riſing ſtalk evaporate, the weight of the air which encompaſſes it on all ſides will make it aſcend vertically: but if, inſtead of evaporating, it congeal, and remain fixed to that extremity whence it was ready to go off, the weight of the air will give it the ſame direction; ſo that the ſtalk will have acquired a ſmall new part vertically laid over it, juſt as the flame in a candle held in any way obliquely to the horizon ſtill continues vertical by the preſſure of the atmoſphere. The new drops of juice that ſucceed will follow the ſame direction; and as all together form the ſtalk, that muſt of courſe be vertical, unleſs ſome particular circumſtance intervene.

The branches, which are at firſt ſuppoſed to proceed laterally out of the ſtalk in the firſt embryo of the plant, though they ſhould even come out in an horizontal direction, muſt alſo raiſe themſelves upwards by the conſtant direction of the nutritious juice, which at firſt ſcarcely meets any reſiſtance in a tender ſupple branch; and afterwards, even though the branch grow more firm, it will act with the more advantage; ſince the branch, being become longer, furniſhes it with a longer arm or lever. The ſlender action of even a little drop becomes very conſiderable by its continuity, and by the aſſiſtance of ſuch circumſtances. Hence may we account for that regular ſituation and direction of the branches,

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branches, since they all make nearly the same constant angle of 45° with the stem, and with one another.

M. Astruc accounts for the perpendicularity of the stems, and their redressing themselves, thus: 1. He thinks the nutritious juice arises from the circumference of the plant, and terminates in the pith: And, 2. That fluids, contained in tubes either parallel or oblique to the horizon, gravitate on the lower part of the tubes, and not at all on the upper. Hence it follows, that, in a plant placed either obliquely or parallel to the horizon, the nutritious juice will act more on the lower part of the canals than on the upper; and by this means they will insinuate more into the canals communicating therewith, and be collected more copiously therein: thus the parts on the lower side will receive more accretion and be more nourished than those on the upper, the extremity of the plant will therefore be obliged to bend upwards.

This principle brings the seed into its due situation at first. In a bean planted upside down, the plume and radicle may be seen with the naked eye shooting at first directly for about an inch; after which they begin to bend, the one downward, and the other upward. The same is the case in a heap of barley to be made into malt, or in a quantity of acorns laid to sprout in a moist place, &c. Each grain of barley and each acorn has a different situation; and yet every sprout tends directly upward, and every root downward, and the curvity or bend they make is greater or less as their situation approaches more or less to the direction wherein no curvature at all would be necessary. But two such opposite motions cannot possibly arise without supposing some difference between the two parts: the only one we know of is, that the plume is fed by a juice imported to it by tubes parallel to its sides, whereas the radicle imbibes its nourishment at every pore in its surface. When the plume therefore is either parallel or inclined to the horizon, the nutritious juice, feeding the lower parts more than the upper, will determine its extremes to turn upward, for the reasons before given. On the contrary, when the radicle is in the like situation, the nutritious juice penetrating through the upper part more copiously than through the under, there will be a greater accretion of the former than of the latter; and the radicle will therefore be bent downwards, and this mutual curvity of the plume and radicle must continue till such time as their sides are nourished alike, which cannot be till they are perpendicular.

Of the Food of PLANTS.—This hath been so fully discussed under the article AGRICULTURE, that little remains to be said upon the subject in this place. The method of making dephlogisticated or vital air *de novo*, is now so much improved, that numberless experiments may be made with it both on animals and vegetables. It appears, indeed, that these two parts of the creation are a kind of counterbalance to one another; and the noxious parts or excrements of the one prove salutary food to the other. Thus, from the animal body continually pass off certain effluvia, which vitiate or *phlogisticate* the air. Nothing can be more prejudicial to animal life than an accumulation of these effluvia: on the other hand, nothing is more favourable to vegetables than those excrementitious effluvia of animals; and accordingly they greedily absorb them from the earth, or from the air. With respect to the excrementitious parts of living vegetables, the case is reversed. The purest air is the common effluvium which passes off from vegetables; and this, however favourable to animal life, is by no means so to vegetable; whence we have an additional proof of the doctrine concerning the food of plants delivered under the article AGRICULTURE.

With regard to the effects of other kinds of air on vegetation, a difference of some consequence took place between Dr Priestley and Dr Percival. The former, in the first volume of his Experiments and Observations on Air, had asserted that fixed air is fatal to vegetable as well as to animal life. This opinion, however, was opposed by Dr Percival, and the contrary one adopted by Dr Hunter of York in the Georgical Essays, vol. v. The experiments related by these two gentlemen would indeed have been decisive, had they been made with sufficient accuracy. That this was the case, however, Dr Priestley denies; and in the 3d volume of his Treatise on Air has fully detected the mistakes in Dr Percival's Experiments; which proceeded in fact from his having used, not fixed air, but common air mixed with a small quantity of fixed air. His experiments, when repeated with the purest fixed air, and in the most careful manner, were always attended with the same effect, namely, the killing of the plant.

It had also been asserted by Drs Percival and Hunter, that water impregnated with fixed air was more favourable to vegetation than simple water. This opinion was likewise examined by Dr Priestley; however, his experiments were indecisive; but seem rather unfavourable to the use of fixed air than otherwise.

Another very remarkable fact with regard to the food of plants has been discovered by Dr Priestley; namely, that some of them, such as the willow, comfrey, and duckweed, are nourished by inflammable air. The first, he says, flourishes in this species of air so remarkably, that, "it may be said to feed upon it with great avidity. This process terminates in the change of what remains of the inflammable air into phlogisticated air, and sometimes into a species of air as good as common air, or even better; so that it must be the *inflammable principle* in the air that the plant takes, converting it, no doubt, into its proper nourishment."

Priestley on Air, vol. v. p. 2.

What the followers of Stahl call phlogisticated air and inflammable air, are so closely allied to each other, that it is no wonder they should serve promiscuously for the food of plants. The reason why both are not agreeable to all kinds of plants, most probably is the different quantity of phlogistic matter contained in them, and the different action of the latent fire they contain; for all plants do not require an equal quantity of nourishment: and such as require but little, will be destroyed by having too much. The action of heat also is essentially necessary to vegetation; and it is probable that very much of this principle is absorbed from the air by vegetables. But if the air by which plants are partly nourished contains too much of that principle, it is very probable that they may be destroyed from this cause as well as the other; and thus inflammable air, which contains a vast quantity of that active principle, may destroy such plants as grow in a dry soil, though it preserves those which grow in a wet one. See VEGETATION.

Dissemination of PLANTS.—So great are the prolific powers of the vegetable kingdom, that a single plant almost of any kind, if left to itself, would, in a short time, overrun

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overrun the whole world. Indeed, ſuppoſing the plant to have been only a ſingle annual, with two ſeeds, it would, in 20 years, produce more than a million of its own ſpecies; what numbers then muſt have been produced by a plant whoſe ſeeds are ſo numerous as many of thoſe with which we are acquainted? In that part of our work we have given particular examples of the very prolific nature of plants, which we need not repeat here; and we have made ſome obſervations on the means by which they are carried to diſtant places. This is a very curious matter of fact, and as ſuch we ſhall now give a fuller account of it.

If nature had appointed no means for the ſcattering of theſe numerous ſeeds, but allowed them to fall down in the place where they grew, the young vegetables muſt of neceſſity have choked one another as they grew up, and not a ſingle plant could have arrived at perfection. But ſo many ways are there appointed for the diſſemination of plants, that we ſee they not only do not hinder each others growth, but a ſingle plant will in a ſhort time ſpread through different countries. The moſt evident means for this purpoſe are,

1. The force of the air.—That the efficacy of this may be the greater, nature has raiſed the ſeeds of vegetables upon ſtalks, ſo that the wind has thus an opportunity of acting upon them with the greater advantage. The ſeed-capſules alſo open at the apex, leſt the ripe ſeeds ſhould drop out without being widely diſperſed by the wind. Others are furniſhed with wings, and a pappous down, by which after they come to maturity, they are carried up into the air, and have been known to fly the diſtance of 50 miles: 138 genera are found to have winged ſeeds.

2. In ſome plants the ſeed-veſſels open with violence when the ſeeds are ripe, and thus throw them to a conſiderable diſtance; and we have an enumeration of 50 genera whoſe ſeeds are thus diſperſed.

3. Other ſeeds are furniſhed with hooks, by which, when ripe, they adhere to the coats of animals, and are carried by them to their lodging places. Linnæus reckons 50 genera armed in this manner.

4. Many ſeeds are diſperſed by means of birds and other animals; who pick up the berries, and afterwards eject the ſeeds uninjured. Thus the fox diſſeminates the privet, and man many ſpecies of fruit. The plants found growing upon walls and houſes, on the tops of high rocks, &c. are moſtly brought there by birds; and it is univerſally known, that by manuring a field with new dung, innumerable weeds will ſpring up which did not exiſt there before: 193 ſpecies are reckoned up which may be diſſeminated in this manner.

5. The growth of other ſeeds is promoted by animals in a different way. While ſome are eaten, others are ſcattered and trodden into the ground by them. The ſquirrel gnaws the cones of the pine, and many of the ſeeds fall out. When the loxia eats off their bark, almoſt his only food, many of their ſeeds are committed to the earth, or mixed in the moraſs with moſs, where he had retired. The glandularia, when ſhe hides up her nuts, often forgets them, and they ſtrike root. The ſame is obſervable of the walnut; mice collect and bury great quantities of them, and being afterwards killed by different animals, the nuts germinate.

6. We are aſtoniſhed to find moſſes, fungi, byſſus, and mucor, growing everywhere; but it is for want of reflecting that their ſeeds are ſo minute that they are almoſt inviſible to the naked eye. They float in the air like atoms, and are dropped everywhere, but grow only in thoſe places where there was no vegetation before; and hence we find the ſame moſſes in North America and in Europe.

7. Seeds are alſo diſperſed by the ocean, and by rivers. "In Lapland (ſays Linnæus), we ſee the moſt evident proofs how far rivers contribute to depoſite the ſeeds of plants. I have ſeen Alpine plants growing upon their ſhores frequently 36 miles diſtant from the Alps; for their ſeeds falling into the rivers, and being carried along and left by the ſtream, take root there.—We may gather likewiſe from many circumſtances how much the ſea furthers this buſineſs.—In Roſlagia, the iſland of Græſœa, Oeland, Gothland, and the ſhores of Scania, there are many foreign and German plants not yet naturalized in Sweden. The centaury is a German plant, whoſe ſeeds being carried by the wind into the ſea, the waves landed this foreigner upon the coaſts of Sweden. I was aſtoniſhed to ſee the veronica maritima, a German plant, growing at Tornea, which hitherto had been found only in Græſœa: the ſea was the vehicle by which this plant was tranſported thither from Germany; or poſſibly it was brought from Germany to Græſœa, and from thence to Tornea. Many have imagined, but erroneouſly, that ſeed corrupts in water, and loſes its principle of vegetation. Water at the bottom of the ſea is ſeldom warm enough to deſtroy ſeeds; we have ſeen water cover the ſurface of a field for a whole winter, while the ſeed which it contained remained unhurt, unleſs at the beginning of ſpring the waters were let down ſo low by drains, that the warmth of the ſun-beams reached to the bottom. Then the ſeeds germinate, but preſently become putreſcent; ſo that for the reſt of the year the earth remains naked and barren. Rain and ſhowers carry ſeeds into the cracks of the earth, ſtreams, and rivers; which laſt, conveying them to a diſtance from their native places, plant them in a foreign ſoil."

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8. Laſtly, ſome ſeeds aſſiſt their projection to a diſtance in a very ſurpriſing manner. The crupina, a ſpecies of centaury, has its ſeeds covered over with erect briſtles, by whoſe aſſiſtance it creeps and moves about in ſuch a manner, that it is by no means to be kept in the hand. If you confine one of them between the ſtocking and the foot, it creeps out either at the ſleeve or neck-band, travelling over the whole body. If the bearded oat, after harveſt, be left with other grain in the barn, it extricates itſelf from the glume; nor does it ſtop in its progreſs till it gets to the walls of the building. Hence, ſays Linnæus, the Dalecarlian, after he has cut and carried it into the barn, in a few days finds all the glumes empty, and the oats ſeparate from them; for every oat has a ſpiral ariſta or beard annexed to it, which is contracted in wet, and extended in dry weather. When the ſpiral is contracted, it drags the oat along with it: the ariſta being bearded with minute hairs pointing downward, the grain neceſſarily follows it; but when it expands again, the oat does not go back to its former place, the roughneſs of the beard the contrary way preventing its return. If you take the ſeeds of equiſetum, or fern, theſe being laid upon paper, and viewed in a microſcope, will be ſeen to leap over any obſtacle as if they had feet; by which they are ſeparated and diſperſed one from another; ſo that a perſon ignorant of this

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this property would pronounce these seeds to be so many mites or small insects.

We cannot finish this article without remarking, that many ingenious men believe that plants have a power of perception. Of this opinion we shall now give an account from the second volume of the Manchester Transactions, where we find some *speculations on the perceptive power of vegetables by Dr Percival*, who attempts to show, by the several analogies of organization, life, instinct, spontaneity, and self-motion, that plants, like animals, are endued with the powers both of perception and enjoyment. The attempt is ingenious, and is ingeniously supported, but in our opinion fails to convince. That there is an analogy between animals and vegetables is certain; but we cannot from thence conclude that they either perceive or enjoy. Botanists have, it is true, derived from *anatomy* and *physiology*, almost all the terms employed in the description of plants. But we cannot from thence conclude, that their organization, though it bears an analogy to that of animals, is the sign of *a living principle*, if to this *principle* we annex the idea of *perception*; yet so fully is our author convinced of the truth of it, that he does not think it extravagant to suppose, that, in some future period, perceptivity may be discovered to extend even beyond the limits now assigned to vegetable life. Corallines, madrepores, millepores, and sponges, were formerly considered as fossil bodies: but the experiments of Count Marsigli evinced, that they are endued with life, and led him to class them with the maritime plants. And the observations of Ellis, Jussieu, and Peyssonel, have since raised them to the rank of animals. The detection of error, in long established opinions concerning one branch of natural knowledge, justifies the suspicion of its existence in others, which are nearly allied to it. And it will appear from the prosecution of our inquiry into the instincts, spontaneity, and self-moving power of vegetables, that the suspicion is not without foundation.

He then goes on to draw a comparison between the instincts of animals and those of vegetables; the calf, as soon as it comes into the world, applies to the teats of the cow; and the duckling, though hatched under a hen, runs to the water.

"Instincts analogous to these (says our author), operate with equal energy on the vegetable tribe. A seed contains a germ, or plant in miniature, and a radicle, or little root, intended by nature to supply it with nourishment. If the seed be sown in an inverted position, still each part pursues its proper direction. The plumula turns upward, and the radicle strikes downward into the ground. A hop-plant, turning round a pole, follows the course of the sun, from south to west, and soon dies, when forced into an opposite line of motion: but remove the obstacle, and the plant will quickly return to its ordinary position. The branches of a honeysuckle shoot out longitudinally, till they become unable to bear their own weight; and then strengthen themselves, by changing their form into a spiral: when they meet with other living branches, of the same kind, they coalesce, for mutual support, and one spiral turns to the right and the other to the left; thus seeking, by an instinctive impulse, some body on which to climb, and increasing the probability of finding one by the diversity of their course: for if the auxiliary branch be dead, the other uniformly winds itself round from the right to the left.

"These examples of the instinctive economy of vegetables have been purposely taken from subjects familiar to our daily observation. But the plants of warmer climates, were we sufficiently acquainted with them, would probably furnish better illustrations of this acknowledged power of animality: and I shall briefly recite the history of a very curious exotic, which has been delivered to us from good authority; and confirmed by the observations of several European botanists."

The doctor then goes on to give a description of the *dionæa muscipula* (B), for which see vol. vi. p. 32.; and concludes, that if he has furnished any presumptive proof of the instinctive power of vegetables, it will necessarily follow that they are endued with some degree of spontaneity. More fully to evince this, however, the doctor points out a few of those phenomena in the vegetable kingdom which seem to indicate spontaneity.—"Several years ago (says he), whilst engaged in a course of experiments to ascertain the influence of fixed air on vegetation, the following fact repeatedly occurred to me. A sprig of mint, suspended by the root, with the head downwards,

(B) Dr Watson, the bishop of Landaff, who has espoused the same side of the question with Dr Percival (see the 5th vol. of his Chemical Essays), reasons thus on the motions of vegetables. "Whatever can produce any effect (says he) upon an animal organ, as the impact of external bodies, heat and cold, the vapour of burning sulphur, of volatile alkali, want of air, &c. are found to act also upon the plants called *sensitive*. But not to insist upon any more instances, the muscular motions of the dionæa muscipula, lately brought into Europe from America, seem far superior in quickness to those of a variety of animals. Now to refer the muscular motions of shell-fish and zoophytes to an internal principle of volition, to make them indicative of the perceptivity of the being, and to attribute the more notable ones of vegetables to certain mechanical dilatations and contractions of parts occasioned by external impulse, is to err against that rule of philosophizing which assigns the same causes for effects of the same kind. The motions in both cases are equally accommodated to the preservation of the being to which they belong, are equally distinct and uniform, and should be equally derived from mechanism, or equally admitted as criterions of perception.

"I am sensible that these and other similar motions of vegetables may by some be considered as analogous to the automatic or involuntary motions of animals; but as it is not yet determined amongst the physiologists, whether the motion of the heart, the peristaltic motion of the bowels, the contractions observable upon external impulse in the muscles of animals deprived of their heads and hearts, be attributable to an irritability unaccompanied with perceptivity, or to an uneasy sensation, there seems to be no reason for entering into so obscure a disquisition; especially since irritability, if admitted as the cause of the motions of vegetables, must *à fortiori* be admitted as the cause of the less exquisite and discernible motions of being universally referred to the animal kingdom."

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downwards, in the middle glass vessel of Dr Nooth's machine, continued to thrive vigorously, without any other pabulum than what was supplied by the stream of mephitic gas to which it was exposed. In 24 hours the stem formed into a curve, the head became erect, and gradually ascended towards the mouth of the vessel; thus producing, by successive efforts, a new and unusual configuration of its parts. Such exertions in the sprig of mint, to rectify its inverted position, and to remove from a foreign to its natural element, seems to evince a volition to avoid what was evil, and to recover what had been experienced to be good. If a plant, in a garden-pot, be placed in a room which has no light except from a hole in the wall, it will shoot towards the hole, pass through it into the open air, and then vegetate upwards in its proper direction. Lord Kames relates, that, 'amongst the ruins of New Abbey, formerly a monastery in Galloway, there grows on the top of a wall a plane tree, 20 feet high. Straitened for nourishment in that barren situation, it several years ago directed roots down the side of the wall till they reached the ground ten feet below: and now the nourishment it afforded to these roots, during the time of descending, is amply repaid; having every year since that time made vigorous shoots. From the top of the wall to the surface of the earth, these roots have not thrown out a single fibre, but are now united into a pretty thick hard root.'

"The regular movements by which the sun-flower presents its splendid disk to the sun have been known to naturalists, and celebrated by poets, both of ancient and modern times. Ovid founds upon it a beautiful story; and Thomson describes it as an attachment of love to the celestial luminary.

'But one, the lofty follower of the sun,
'Sad when he sets, shuts up her yellow leaves,
'Drooping all night; and when he warm returns,
'Points her enamour'd bosom to his ray.'

Summer, line 216.

Dr Percival next touches on motion; he mentions corallines, sea-pens*, oysters, &c. as endued with the power of motion in a very small degree, and then he speaks in the following manner. "Mr Miller (says he), in his late account of the island of Sumatra, mentions a species of coral, which the inhabitants have mistaken for a plant, and have denominated it *lalan-cout*, or sea-grass. It is found in shallow bays, where it appears like a straight stick, but when touched withdraws itself into the sand. Now if self-moving faculties like these indicate animality, can such a distinction be denied to vegetables possessed of them in an equal or superior degree? The water-lily, be the pond deep or shallow in which it grows, pushes up its flower-stems till they reach the open air, that the farina fecundans may perform without injury its proper office. About 7 in the morning the stalk erects itself, and the flowers rise above the surface of the water: in this state they continue till four in the afternoon, when the stalk becomes relaxed, and the flowers sink and close. The motions of the sensitive plant have been long noticed with admiration, as exhibiting the most obvious signs of perceptivity. And if we admit such motions as criteria of a like power in other beings, to attribute them in this instance to mere mechanism, actuated solely by external impulse, is to deviate from the soundest rule of philosophizing, which directs us not to multiply causes when the effects appear to be the same. Neither will the laws of electricity better solve the phenomena of this animated vegetable: for its leaves are equally affected by the contact of electric and non-electric bodies; show no change in their sensibility whether the atmosphere be dry or moist; and instantly close when the vapour of volatile alkali or the fumes of burning sulphur are applied to them. The powers of chemical stimuli to produce contractions in the fibres of this plant, may perhaps lead some philosophers to refer them to the *vis insita*, or irritability, which they assign to certain parts of organized matter, totally distinct from, and independent of, any sentient energy. But the hypothesis is evidently a solecism, and refutes itself. For the presence of irritability can only be proved by the experience of irritations, and the idea of irritation involves in it that of feeling.

* See *Pennatula*, *Ostrea*, *Mytilus*, &c.

"But there is a species of the order of decandria, which constantly and uniformly exerts a self-moving power, uninfluenced either by chemical stimuli, or by any external impulse whatsoever. This curious shrub, which was unknown to Linnæus, is a native of the East Indies, but has been cultivated in several botanical gardens here. I had an opportunity of examining it in the collection of the late Dr Brown. See HEDYSARUM.— I cannot better comment on this wonderful degree of vegetable animation than in the words of Cicero. *Inanimum est omne quod pulsu agitatur externo; quod autem est animal, id motu cietur interiore et suo.*

"I have thus attempted, with the brevity prescribed by the laws of this society, to extend our views of animated nature; to gratify the mind with the contemplation of multiplied accessions to the general aggregate of felicity; and to exalt our conceptions of the wisdom, power, and beneficence of God. In an undertaking never yet accomplished, disappointment can be no disgrace: in one directed to such noble objects, the motives are a justification, independently of success. Truth, indeed, obliges me to acknowledge, that I review my speculations with much diffidence; and that I dare not presume to expect they will produce any permanent conviction in others, because I experience an instability of opinion in myself. For, to use the language of Tully, *Nescio quomodo, dum lego, assentior; cum posui librum, assensio omnis illa elabitur.*—But this scepticism is perhaps to be ascribed to the influence of habitual preconceptions, rather than to a deficiency of reasonable proof. For besides the various arguments which have been advanced in favour of vegetable perceptivity, it may be further urged, that the hypothesis recommends itself by its consonance to those higher analogies of nature, which lead us to conclude, that the greatest possible sum of happiness exists in the universe. The bottom of the ocean is overspread with plants of the most luxuriant magnitude. Immense regions of the earth are covered with perennial forests. Nor are the Alps, or the Andes destitute of herbage, though buried in deeps of snow. And can it be imagined that such profusion of life subsists without the least sensation or enjoyment? Let us rather, with humble reverence, suppose, that vegetables participate, in some low degree, of the common allotment of vitality; and that our great Creator hath apportioned

apportioned good to all living things, 'in number, weight, and meaſure." See *SENSITIVE Plant*, MIMOSA, *DIONÆA Muſcipula*, *Vegetable MOTION*, *&c.*

To theſe ingenious and ſpirited obſervations, we ſhall ſubjoin nothing of our own, but leave our readers to determine for themſelves (c). Speculations of this kind, when carried on by ſober men, will never be productive of bad conſequences; but by the ſubtle ſceptic, or the more unwary inquirer, they may be made the engine of very dangerous errors. By this we do not mean to inſinuate that the ſpirit of inquiry ſhould be ſuppreſſed, becauſe that ſpirit, in the hands of weak or of wicked men, may be abuſed. By thoſe, however, who know the bad conſequences that may be drawn, and indeed that have been drawn, from the opinions we have now given an account of, our caution will not be deemed impertinent.

PLANTS growing on Animals. See *INSECTS giving root to Plants.*

Sexes of PLANTS. See SEXES and BOTANY.

Colours of PLANTS. See *COLOUR of Plants.*

Colours extracted from PLANTS. See *COLOUR-making.*

Method of Drying and Preſerving PLANTS for Botaniſts.—Many methods have been deviſed for the preſervation of plants: we ſhall relate only thoſe that have been found moſt ſucceſsful.

Withering's Botanical Arrangement, Introd. p. 48.

Firſt prepare a preſs, which a workman will make by the following directions. Take two planks of wood not liable to warp. The planks muſt be two inches thick, 18 inches long, and 12 inches broad. Get four male and four female ſcrews, ſuch as are commonly uſed for ſecuring ſaſh windows. Let the four female ſcrews be let into the four corners of one of the planks, and correſponding holes made through the four corners of the other plank for the male ſcrews to paſs through, ſo as to allow the two planks to be ſcrewed tightly together. It will not be amiſs to face the bearing of the male ſcrews upon the wood with iron plates; and if the iron plates went acroſs from corner to corner of the wood, it would be a good ſecurity againſt the warping.

Secondly, get half a dozen quires of large ſoft ſpongy paper (ſuch as the ſtationers call *bloſſom blotting paper* is the beſt), and a few ſheets of ſtrong paſteboard.

The plants you wiſh to preſerve ſhould be gathered in a dry day, after the ſun hath exhaled the dew; taking particular care to collect them in that ſtate wherein their generic and ſpecific characters are moſt conſpicuous. Carry them home in a tin box nine inches long, four inches and a half wide, and one inch and a half deep. Get the box made of the thinneſt tinned iron that can be procured; and let the lid open upon hinges. If any thing happen to prevent the immediate uſe of the ſpecimens you have collected, they will be kept freſh two or three days in this box much better than by putting them in water. When you are going to preſerve them, ſuffer them to lie upon a table until they become limber; and then they ſhould be laid upon a paſteboard, as much as poſſible in their natural form, but at the ſame time with a particular view to their generic and ſpecific characters. For this purpoſe it will be adviſeable to ſeparate one of the flowers, and to diſplay the generic character. If the ſpecific character depend upon the flower or upon the root, a particular diſplay of that will be likewiſe neceſſary. When the plant is thus diſpoſed upon the paſteboard, cover it with eight or ten layers of ſpongy paper, and put it into the preſs. Exert only a ſmall degree of preſſure for the firſt two or three days; then examine it, unfold any unnatural plaits, rectify any miſtakes, and, after putting freſh paper over it, ſcrew the preſs harder. In about three days more ſeparate the plant from the paſteboard, if it is ſufficiently firm to allow of a change of place; put it upon a freſh paſteboard, and, covering it with freſh bloſſom paper, let it remain in the preſs a few days longer. The preſs ſhould ſtand in the ſunſhine, or within the influence of a fire.

When it is perfectly dry, the uſual method is to faſten it down, with paſte or gum water, on the right-hand inner page of a ſheet of large ſtrong writing-paper. It requires ſome dexterity to glue the plant neatly down, ſo that none of the gum or paſte may appear to defile the paper. Preſs it gently again for a day or two, with a half ſheet of bloſſom-paper betwixt the folds of the writing paper. When it is quite dry, write upon the left-hand inner page of the paper the name of the plant; the ſpecific character; the place where, and the time when, it was found; and any other remarks you may think proper. Upon the back of the ſame page, near the fold of the paper, write the name of the plant, and then place it in your cabinet. A ſmall quantity of finely powdered arſenic, or corroſive ſublimate, is uſually mixed with the paſte or gum-water, to prevent the devaſtations of inſects; but the ſeeds of ſtaves-acre finely powdered will anſwer the ſame purpoſe, without being liable to corrode or to change the colour of the more delicate plants. Some people put the dried plants into the ſheets of writing paper, without faſtening them down at all; and others only faſten them by means of ſmall ſlips of paper, paſted acroſs the ſtem or branches. Where the ſpecies of any genus are numerous, and the ſpecimens are ſmall, ſeveral of them may be put into one ſheet of paper.

Another more expeditious method is to take the plants out of the preſs after the firſt or ſecond day; let them remain upon the paſteboard; cover them with five or ſix leaves of bloſſom paper, and iron them with a hot ſmoothing

(c) In the 2d volume of *Tranſactions of the Linnæan Society*, we find Dr Percival's reaſoning very ably combated, as far as he draws his conſequences from the external motions of plants; where it is argued, that theſe motions, though in ſome reſpects ſimilar to thoſe of animals, can and ought to be explained, without concluding that they are endowed either with perception or volition. Mr Townſon concludes his paper in theſe words: "When all is conſidered (ſays he), I think we ſhall place this opinion among the many ingenious flights of the imagination, and ſoberly follow that blind impulſe which leads us naturally to give ſenſation and perceptivity to animal life, and to deny it to vegetables; and ſo ſtill ſay with Ariſtotle, and our great maſter Linnæus, *Vegetabilia creſcunt & vivunt; animalia creſcunt, vivunt, & ſentiunt.*"

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ſmoothing iron until they are perfectly dry. If the iron be too hot, it will change the colours; but ſome people, taught by long practice, will ſucceed very happily. This is quite the beſt method to treat the orchis and other ſlimy mucilaginous plants.

Another method is to take the plants when freſh gathered, and, inſtead of putting them into the preſs, immediately to faſten them down to the paper with ſtrong gum-water: then dip a camel-hair pencil into ſpirit-varniſh, and varniſh the whole ſurface of the plant two or three times over. This method ſucceeds very well with plants that are readily laid flat, and it preſerves their colours better than any other. The ſpirit varniſh is made thus. To a quart of highly rectified ſpirit of wine put five ounces of gum ſandarach; two ounces of maſtich in drops; one ounce of pale gum elemi, and one ounce of oil of ſpike-lavender. Let it ſtand in a warm place, and ſhake it frequently to expedite the ſolution of the gums.

Where no better convenience can be had, the ſpecimens may be diſpoſed ſyſtematically in a large folio book; but a vegetable cabinet is upon all accounts more eligible. With the aſſiſtance of the following deſcription a workman may readily make one. The drawers muſt have backs and ſides, but no other front than a ſmall ledge. Each drawer will be 14 inches wide, and 10 inches from the back to the front, after allowing half an inch for the thickneſs of the two ſides, and a quarter of an inch for the thickneſs of the back. The ſides of the drawers, in the part next the front, muſt be ſloped off in a ſerpentine line, ſomething like what the workmen call an *ogee*. The bottoms of the drawers muſt be made to ſlide in grooves cut in the uprights, ſo that no ſpace may be loſt betwixt drawer and drawer. After allowing a quarter of an inch for the thickneſs of the bottom of each drawer, the clear perpendicular ſpace in each muſt be as in the following table.

I.	Two-tenths of an inch.	XIV.	Three inches and eight-tenths.
II.	One inch and two-tenths.	XV.	Three inches and four-tenths.
III.	Four inch. and ſix-tenths.	XVI.	One inch and three-tenths.
IV.	Two inches and three-tenths.	XVII	Two inches and eight-tenths.
V.	Seven inches and eight-tenths.	XVIII.	Six-tenths of an inch.
VI.	Two inches and two-tenths.	XIX.	Ten inches.
VII.	Two-tenths of an inch.	XX.	One inch and nine-tenths.
VIII.	One inch and four-tenths.	XXI.	Four inches and four-tenths.
IX.	Two-tenths of an inch.	XXII.	Two inches and ſix-tenths.
X.	Two inches and eight-tenths.	XXIII.	One inch and two-tenths.
XI.	One inch and two-tenths.	XXIV	Seventeen inches.
XII.	Three inches and five-tenths.		
XIII.	Two inches and four-tenths.		

This cabinet ſhuts up with two doors in front; and the whole may ſtand upon a baſe, containing a few drawers for the reception of duplicates and papers.

Foſſil PLANTS. Many ſpecies of tender and herbaceous plants are found at this day, in great abundance, buried at conſiderable depths in the earth, and converted, as it were, into the nature of the matter they lie among; foſſil wood is often found very little altered, and often impregnated with ſubſtances of almoſt all the different foſſil kinds, and lodged in all the ſeveral ſtrata, ſometimes firmly imbedded in hard matter; ſometimes looſe: but this is by no means the caſe with the tenderer and more delicate ſubjects of the vegetable world. Theſe are uſually immerſed either in a blackiſh ſlaty ſubſtance, found lying over the ſtrata of coal, elſe in looſe nodules of ferruginous matter of a pebble-like form, and they are always altered into the nature of the ſubſtance they lie among: what we meet with of theſe are principally of the fern kind; and what is very ſingular, though a very certain truth, is, that theſe are principally the ferns of American growth, not thoſe of our own climate. The moſt frequent foſſil plants are the polypody, ſpleenwort, oſmund, trichomanes, and the ſeveral larger and ſmaller ferns; but beſides theſe there are alſo found pieces of the equiſetum or horſe-tail, and joints of the ſtellated plants, as the clivers, madder, and the like; and theſe have been too often miſtaken for flowers; ſometimes there are alſo found complete graſſes, or parts of them, as alſo reeds, and other watery plants; ſometimes the ears of corn, and not unfrequently the twigs or bark, and impreſſions of the bark and fruit of the pine or fir kind, which have been, from their ſcaly appearance, miſtaken for the ſkins of fiſhes; and ſometimes, but that very rarely, we meet with moſſes and ſea-plants.

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Many of the ferns not unfrequently found, are of very ſingular kinds, and ſome ſpecies yet unknown to us; and the leaves of ſome appear ſet at regular diſtances, with round protuberances and cavities. The ſtones which contain theſe plants ſplit readily, and are often found to contain, on one ſide, the impreſſion of the plant, and on the other the prominent plant itſelf; and, beſide all that have been mentioned, there have been frequently ſuppoſed to have been found with us ears of common wheat, and of the maize or Indian corn; the firſt being in reality no other than the common endmoſt branches of the firs, and the other the thicker boughs of various ſpecies of that and of the pine kind, with their leaves fallen off; ſuch branches in ſuch a ſtate cannot but afford many irregular tubercles and papillæ, and, in ſome ſpecies, ſuch as are more regularly diſpoſed.

Theſe are the kinds moſt obvious in England; and theſe are either immerſed in the ſlaty ſtone which conſtitutes whole ſtrata, or in flatted nodules uſually of about three inches broad, which readily ſplit into two pieces on being ſtruck.

They are moſt common in Kent, in coal-pits near Newcaſtle, and the foreſt of Dean in Glouceſterſhire; but are more or leſs found about almoſt all our coal-pits, and many of our iron mines. Though theſe ſeem the only ſpecies of plants found with us, yet in Germany there are many others, and thoſe found in different ſubſtances. A whitiſh ſtone, a little harder than chalk, frequently contains them: they are found alſo often in a gray ſlaty ſtone of a firmer texture, not unfrequently in a blackiſh one, and at times in many others. Nor are the bodies themſelves leſs various here than the matter in which they are contained: the leaves of trees are found in great abundance, among which thoſe of the willow, poplar, white thorn, and pear trees, are the moſt common; ſmall branches of box, leaves of the olive tree, and ſtalks of garden thyme, are alſo found there; and ſometimes ears of the various ſpecies of corn, and the larger as well as the ſmaller moſſes in great abundance.

Theſe ſeem the tender vegetables, or herbaceous plants, certainly found thus immerſed in hard ſtone, and

buried

buried at great depths in the earth: others of many kinds there are also named by authors; but as in bodies so imperfect errors are easily fallen into, these seem all that can be ascertained beyond mere conjecture.

PLANTS, method of preserving them in their original shape and colour. Wash a sufficient quantity of fine sand, so as perfectly to separate it from all other substances; dry it; pass it through a sieve to clear it from any gross particles which would not rise in the washing: take an earthen vessel of a proper size and form, for every plant and flower which you intend to preserve; gather your plants and flowers when they are in a state of perfection, and in dry weather, and always with a convenient portion of the stalk: heat a little of the dry sand prepared as above, and lay it in the bottom of the vessel, so as equally to cover it; lay the plant or flower upon it so as that no part of it may touch the sides of the vessel: sift or shake in more of the same sand by little upon it, so that the leaves may be extended by degrees, and without injury, till the plant or flower is covered about two inches thick: put the vessel into a stove, or hot-house, heated by little and little to the 50th degree; let it stand there a day or two, or perhaps more, according to the thickness and succulence of the flower or plant; then gently shake the sand out upon a sheet of paper, and take out the plant, which you will find in all its beauty, the shape as elegant, and the colour as vivid, as when it grew.

Some flowers require certain little operations to preserve the adherence of their petals, particularly the tulip; with respect to which it is necessary, before it is buried in the sand, to cut the triangular fruit which rises in the middle of the flower; for the petals will then remain more firmly attached to the stalk.

A hortus siccus prepared in this manner would be one of the most beautiful and useful curiosities that can be.

Moving PLANT. See HEDYSARUM, BOTANY *Index.*

Sea PLANTS. See *SEA Plants.*

Sensitive PLANT. See MIMOSA, BOTANY *Index.*

PLANT-Lice, Vine-fretters, or *Pucerons.* See APHIS, ENTOMOLOGY *Index.*

PLANTA, a PLANT. See PLANT.

PLANTA Fœminea, a female plant, is one which bears female flowers only. It is opposed to a *male* plant, which bears only male flowers; and to an *androgynous* one, which bears flowers of both sexes. Female plants are produced from the same seed with the male, and arrange themselves under the class of diœcia in the sexual method.

PLANTAGENET, the surname of the kings of England from Henry II. to Richard III. inclusive. Antiquarians are much at a loss to account for the origin of this name; and the best derivation they can find for it is, that Fulk, the first earl of Anjou of that name, being stung with remorse for some wicked action, went in pilgrimage to Jerusalem as a work of atonement; where, being soundly scourged with broom twigs, which grew plentifully on the spot, he ever after took the surname of *Plantagenet* or *broomstalk,* which was retained by his noble posterity.

PLANTAGO, PLANTAIN; a genus of plants belonging to the tetrandria class. See BOTANY *Index.*—Of the plantain there are the following species: The common broad-leaved plantain, called *waybred* or *way-*

1

born; because it commonly grows by the wayside; the great hoary plantain, or lambs-tongue; the narrow-leaved plantain, or ribwort.

PLANTAIN. See PLANTAGO, BOTANY *Index.*

PLANTAIN Tree. See MUSA, BOTANY *Index.*

PLANTATION, in the West Indies, denotes a spot of ground which a planter, or person arrived in a new colony, pitches on to cultivate for his own use, or is assigned for that purpose. However, the term *plantation* is often used in a term synonymous with colony. See COLONY.

PLANTERSHIP, in a general sense, the business of a planter.

PLANTERSHIP, in the West Indies, denotes the management of a sugar plantation, including not only the cultivation of the cane, but the various processes for the extraction of the sugar, together with the making of sugar-spirits. See RUM, SACCHARUM, and SUGAR.

To effect a design so comprehensive, it is necessary for a planter to understand every branch of the art precisely, and to use the utmost attention and caution both in the laying down and executing of his plans. It is therefore the duty of a good planter to inspect every part of his plantation with his own eyes; to place his provisions, stores, and utensils, in regular order, and in safe repositories; that by preserving them in perfection, all kinds of waste may be prevented.

But as negroes, cattle, mules, and horses, are as it were the nerves of a sugar-plantation, it is expedient to treat that subject with some accuracy.

Of Negroes, Cattle, &c.] In the first place, then, as it is the interest of every planter to preserve his negroes in health and strength; so every act of cruelty is not less repugnant to the master's real profit, than it is contrary to the laws of humanity: and if a manager considers his own ease and his employer's interest, he will treat all negroes under his care with due benevolence; for good discipline is by no means inconsistent with humanity: on the contrary, it is evident from experience, that he who feeds his negroes well, proportions their labour to their age, sex, and strength, and treats them with kindness and good nature, will reap a much larger product, and with infinitely more ease and self-satisfaction, than the most cruel taskmaster, who starves his negroes, or chastises them with undue severity. Every planter then who wishes to grow rich with ease, must be a good economist; must feed his negroes with the most wholesome food, sufficient to preserve them in health and vigour. Common experience points out the methods by which a planter may preserve his people in health and strength. Some of his most fruitful land should be allotted to each negro in proportion to his family, and a sufficient portion of time allowed for the cultivation of it; but because such allotment cannot in long droughts produce enough for his comfortable support, it is the incumbent duty of a good planter to have always his stores well filled with Guinea corn, yams, or eddoes, besides potatoes growing in regular succession: for plenty begets cheerfulness of heart, as well as strength of body; by which more work is effected in a day by the same hands than in a week when enervated by want and severity. Scanty meals may sustain life; but it is evident, that more is requisite to enable a negro or any other person to go through the necessary labours. He, therefore, who will reap plentifully, must plant great abundance of provisions as well

Martin on Plantership.

as

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as sugar-canes; and it is nature's economy so to fructify the soil by the growth of yams, plantains, and potatoes, as to yield better harvests of sugar, by that very means, than can be produced by many other arts of cultivation. Plantains are the principal support of all the negroes in Jamaica; and are also much cultivated, at great expence of manure, in Barbadoes; but ought not to be solely depended upon in climates subject to hurricanes. A celebrated planter and economist of the last-mentioned island, who raised an immense fortune from very small beginnings only by planting, affirmed, that he fed constantly at least 300 negroes out of 12 acres of plantains. How that excellent produce came to be so long neglected in some of the islands it is hard to guess; but at present the neglect seems to be founded upon a vulgar error, that plantains cannot thrive in any other than low moist soils. In such places, no doubt, they flourish most luxuriantly; but yet they thrive and bear fruit abundantly on mountains and in marshes, and in the driest black mould upon marle or rocks, and even in sharp gravelly soils, as may be evinced by numberless instances.

However plenty of wholesome food may be conducive to health, there are also other means, equally necessary to the strength and longevity of negroes, well worth the planter's attention; and those are, to choose airy dry situations for their houses; and to observe frequently that they be kept clean, in good repair, and perfectly water-tight; for nastiness, and the inclemencies of weather, generate the most malignant diseases. If these houses are situated also in regular order, and at due distances, the spaces may at once prevent general devastations by fire, and furnish plenty of fruits and pot-herbs, to please an unvitiated palate, and to purify the blood. Thus then ought every planter to treat his negroes with tenderness and generosity, that they may be induced to love and obey him out of mere gratitude, and become real good beings by the imitation of his behaviour; and therefore a good planter, for his own ease and happiness, will be careful of setting a good example.

Having thus hinted the duties of a planter to his negroes, let the next care be of cattle, mules, and horses. The planters of Barbadoes (who are perhaps the most skilful of all others, and exact to a nicety in calculations of profit and loss), are, with respect to their cattle, the most remiss of any in all the islands; as if the carriage of canes to the mill, and of plantation-produce to the market, was not as essential as any other branch of plantership. At Barbadoes, in particular, the care of these animals is of more importance: because the soil, worn out by long culture, cannot yield any produce without plenty of dung. Some planters are nevertheless so ingeniously thrifty, as to carry their canes upon negroes heads; acting in that respect diametrically opposite to their own apparent interest, which cannot be served more effectually than by saving the labour of human hands, in all cases where the labour of brutes can be substituted; and for that end, no means of preserving those creatures in health and strength ought to be neglected.

The first care therefore is to provide plenty and variety of food. In crop-time, profusion of cane-tops may be had for the labour of carriage; but they will be more wholesome and nutritious if tedded like hay by the sun's heat, and sweated by laying them in heaps a few days before they are eaten. In this season of abundance, great ricks of cane-tops (the butt ends turned inwards) should be made in the most convenient corner of each field, to supply the want of pasturage and other food: and these are very wholesome if chopped into small parts, and mixed sometimes with common salt or sprinkled with melasses mixed with water; but yet the cattle require change of food to preserve them in strength; such as Guinea-corn, and a variety of grass, which every soil produces with a little care in moist weather; and indeed this variety is found necessary in all climes.

But since that variety is not to be had during those severe droughts to which hot climates are liable, and much less in those small islands which cannot furnish large tracts of meadow-lands for hay, the only resource is the fodder of cane-tops or tedded Guinea-corn leaves; which are very nutritious, and may be preserved in perfection for more than a whole year, provided the tops or Guinea-corn are well tedded for three or four hot days as they lie spread in the field; and then, being tied into bundles or sheaves, must lie in the hot sun for three or four days more, when they may be fit to be put up into ricks. The best method of making them is in an oblong figure, about 30 feet in length, and 16 or 18 feet wide; seven feet high at the sides, and from thence sloping like the roof of an house, the ridge of which must be thatched very carefully; for the sides may be secured from wet by placing the bundles with the butts upwards towards the ridge, in courses, and lapping the upper over the lower course.

The best method of forming those ricks is to place the first course of bundles all over the base one way; the second course reversely; and so alternately till the rick be finished.

When cattle are to be fed with this fodder, it must be observed to take down the bundles from the top, at the west end of the rick, to the bottom; for all these ricks must stand east and west lengthwise, as well to secure them from being overturned by high winds, as for the convenience of preserving them from wet, which cannot be done when ricks are made round. By this husbandry, an herd of cattle may be kept in strength, either in severe droughts, or in wet seasons when grass is purgative; and thus the necessity or expence of large pastures may be totally saved. The hay-knife used in England for cutting hay, answers for cutting ricks of tops.

The method of tedding Guinea-corn to make a kind of hay, will require a little explanation here. When Guinea-corn is planted in May, and to be cut down in July, in order to bear seed that year, that cutting, tedded properly, will make an excellent hay, which cattle prefer to meadow hay. In like manner, after Guinea-corn has done bearing seed, the after crop will furnish a great abundance of that kind of fodder which will keep well in ricks for two or three years.

The next care of a planter is to provide shade for his cattle; either by trees where they are fed in the heat of the day, if his soil requires not dung; or by building a flat shed over the pen where cattle are confined for making it. That such sheds are essentially necessary to the well-being of all animals in hot weather, is apparent to every common observer, who cannot fail of seeing each creature forsaking the most luxuriant pastures in the heat of the day for the sake of shade; thus convincing

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vincing the owners, by instinctive argument, that shade is almost as necessary to the well-being of the brute creatures as food. Yet, notwithstanding that demonstration from the unerring course of nature, throughout all our islands (except in a very few instances), these poor creatures are exposed to the scorching sun-beams without mercy. Such inhuman neglect is not always so much the effect of inattention as of a mistaken notion that sheds are impedimental to the making of much dung; but a flat shed, covered with cane-trash, may be so made as to let rain pass through it without admission of sun-beams. This will do for cattle; but mules, which are spirited creatures, and work themselves by draught into a foaming heat, should be put into a warm stable, until quite cool: for turning them loose to pasture when so hot, is probably the cause of their destruction by the glanders.

If the care of providing shade for brute creatures is so much the duty and interest of their owners, how much more is it agreeable to the laws of humanity to provide shade for human creatures travelling upon the high-roads in this hot climate? Nothing surely of so much beauty costs so little expence as planting cocoa-nut or spreading timber trees in avenues along the highways, if each proprietor of the lands adjoining hath any taste of elegance, or feeling for other men: but both those kinds of trees will yield also great profit to the proprietor, by furnishing him with timber, when perhaps not otherwise to be had; or with a delicious milk, fitted by nature to cool the effervescence of the blood in this hot region; and also to improve the spirits made from sugar to the delicacy and softness of arrack. Cocoa-nut and cabbage trees are both very beautiful and shady, bearing round heads of great expansion, upon natural trunks or pillars of elegant proportion, and of such a height as to furnish a large shade, with a free circulation of air equally refreshing to man and beast.

The common objection of injury to canes by the roots of such trees growing on their borders, may be easily removed by digging a small trench between the canes and trees, which may intercept their roots, and oblige them to seek sustenance in the common road. Let it also be considered, besides the benefits above suggested, that the planter will thus beautify his estate to the resemblance of a most sumptuous garden. And probably that very beauty might not only render the islands more healthful to the inhabitants, by preserving them from fevers kindled by the burning sun-beams, but also much more fruitful, by making the weather more seasonable: for as, by cutting down all its woods, a hot country becomes more subject to excessive droughts; so, by replanting it in the manner above described, this inconvenience would probably be prevented.

Let then the planter be kind not only to his fellow-creatures, but merciful to his beasts; giving them plenty and variety of wholesome food, clear water, cool shade, and a clean bed, bleeding them after a long course of hard labour, currying their hides from filth and ticks (A); affording them salt and other physic when necessary; protecting them from the flaying rope-lashes of a cruel driver (who needs no other instrument than a goad); proportioning their labour to their strength; and by every art rendering their work as easy as possible. The general management of planters is not, perhaps, more defective in any other respect than in this: for, by pairing the cattle unequally, and by the drivers ill conduct in writhing to the right and left, the poor creatures are fatigued by much needless labour. A horse ought therefore to be harnessed before them as a leader. This docile creature, by being led in a straight line, will soon learn to be an unerring guide, and the cattle will follow in the same direction with united strength, and consequently with more effect and less fatigue to each individual.

The Portuguese of Madeira, by their poverty and scantiness of pasture, breed the smallest kind of cattle; and yet one yoke of them will draw a much greater weight than a pair of our largest oxen, solely by an equal exertion of their joint strength. That equality or evenness of draught is preserved by boring gimblet holes through their horns, within two inches of the points, and running a thong of leather, through those holes, so as to tie the horns of each pair at six inches distance from each other. By this ligature the pair of cattle are absolutely hindered from turning different ways, and draw in an even direction with united force. Thus it appears evidently from reason, as well as from experience, that the labour of our beasts may, by a little contrivance, be rendered more easy and effectual.

Of the Culture of various Soils.] In the British sugar-colonies there is as great a variety of soils as in any country of Europe; some naturally very rich or fruitful, yielding a luxuriant product with little labour or culture. This fruitful soil is of three kinds: a loose hazel mould mixed with sand, like that of St Christopher's, and is the best in the known world for producing sugar in great quantity, and of the best quality. The brick mould of Jamaica is somewhat of the same nature, and next in value; and then the various mixtures of mould and gravel, to be found in veins or plats over all the other islands. When any of these soils are exhausted of their fertility by long and injudicious culture, they may be restored by any kind of dung well rotted; for these (B) warm soils cannot bear hot unrotten dung, without being laid fallow for a considerable time after it. Another improvement is by sea-sand or sea-weed; or by digging in the cane-trash into steep lands, and by letting it lie to rot for some months. A third method is, by ploughing and laying it fallow; and the fourth method (the best of all), is by folding the fallows by sheep. But this can be practised only where there are extensive pastures; nor can the plough be employed where the soil abounds with large stones. In that case, however, the former method of digging in trash

(A) One pound of native sulphur, a quart of lamp-oil, and the like quantity of hog's-lard, intimately mixed and made into an ointment, is a cure for the mange, lice, &c.

(B) These soils, which are naturally loose and upon marle, Mr Martin calls *hot soils*; and these, he says, have been much injured in some of the islands by dung hastily made with marle: but if the sediment of lees were thrown into these pens, after being turned over, it would much improve the dung.

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trash will be nearly as effectual, though more expensive, by hand-labour or hoe-ploughing.

The next best soil for producing good sugar is a mould upon clay, which if shallow requires much culture and good labour, or its produce will be small in quantity, though of a strong grain and bright colour, so as to yield most profit to the refiner of any sugar, except that produced from an hazel or gravelly soil, as before mentioned. All the black mould soils upon marle are generally fruitful, and will take any kind of dung; but yield not so strong or large-grained sugar. Marle, however, of a white, yellow, or blue colour, or rich mould from washes, or ashes of every kind, are excellent for every strong soil, as the chief ingredient in the compost of dung: either of them will do alone for stiff lands; but the yellow and chocolate marle are the most soapy, and the richest kind of manure (except fine mould) for all stiff lands. If these are well opened, pulverized by culture, and mixed with hot dung, or any kind of loose earth or marle, they will produce as plentifully as lighter soils: and all kinds of clay-soils, except that of a white colour, have these two advantages above the finest gravel soils, that they do not scorch soon by dry weather, and never grow weary of the same manure, as most other soils do.

The extraordinary hand-labour bestowed in making dung, may be saved by the art of caving, now in general use in England. Ten mules or horses, and two light tumbrels with broad wheels, and ten able negroes, may, by the common use of spades, shovels, and light mattocks or grubbing hoes, make more dung than 60 able negroes can do in the present methods.

If marle lies upon rising grounds, or in hillocks, as it often does, the pit is to be opened at the foot of the declivity; which being dug inwards, till the bank is three feet high, then it is to be *caved* thus. Dig an hollow space of 12 or 18 inches deep under the foot of the bank; then dig into each side of it another perpendicular cut of the same depth, and 18 inches wide from the top of the bank to the bottom: that being finished, make a small trench a foot or two from the brink of the bank; pour into it water till full; and when that is done, fill it again, till the water soaking downward makes the marle separate and fall down all at once. This may be repeated till the pit rises to 50 feet high; and then many hundreds of cart-loads of marle may be thrown down by four negroes in two hours; from whence it may be carted into cattle pens, or laid out upon lands, as occasion requires. Five or six negroes with spades or shovels will keep two or three tumbrels employed according to the distance of cartage: and thus as much dung may be made by ten negro men as will dung richly at least 70 or 80 acres of land every year, and laid out also with the assistance of cattle-carts: An improvement highly worthy every planter's consideration, when negroes and feeding them are so expensive; and this is no speculation, but has been confirmed by practice. In level lands, the same operation may be as effectual, provided the mouth of the pit be opened by gradual descent to any depth: but when marle is to be found on the sides of hills, the operation is less laborious for the horses. But if the surface of the marle-pits (as it often happens) be covered with clay or stiff soil, so that the water cannot quickly soak from the trench above; in that case, pieces of hard wood, made like piles, four feet long, and four inches square, pointed at one end, and secured at the other square head by an iron clamp, may be driven by heavy mauls into the trench, as so many wedges, which will make the caved part tumble down: but a skilful eye must watch the last operation, or the labourers may be buried or hurt.

But then clay soils that are level, and subject to be drowned, or to retain water in stagnated pools, can never be made fruitful by any kind of manure, without being first well drained: for water lying upon any soil will most certainly transform it to a stiff unfruitful clay; as appears evidently by the bogs of Ireland, the fens of Lincoln and Cambridgeshire, and even by the ponds of Barbadoes situated in the deepest and lightest black mould; for that fine soil being washed into those ponds, becomes the stiffest black clay, not fit even for an ingredient in dung, until it has been laid dry, and exposed to the sun for a whole year: but when these bogs and fens are well drained, they become the most fruitful soils. Natural clay the celebrated Boerhaave thinks the fattest of all soils; but then it must be opened by culture, marle, or sandy manures. It is hard to conjecture how the opinion prevailed in the British plantations, that sandy gut-mould was most unfit for clay-soils, as being the means of binding them to the compactness of brick; whereas it is proved, from long experience, to be one of the best means of opening clay soils, and rendering them abundantly fruitful. Brick is made of *clay alone*; no sand being used in it, farther than to sprinkle the board, on which it is moulded into shape. From repeated experience it appears, that a mixture of sand in gut-mould is the best of all manure for stiff and barren clay-lands; provided they be well drained, by throwing the whole soil into round ridges of 12 feet wide, with furrows of three feet wide between each ridge. And this is done with little more hand-labour than that of hoe-ploughing well in the common way. For if a piece of land be marked in lines at seven feet and a half distance from each other, and the labourers are set in to hoe-plough at the second line, hauling back each clod 12 inches; half the ridge, and near half the furrow, is made at the same time: and thus a piece of land may be round-ridged, and the furrows all made at once, by the common operation of hoe-ploughing, provided the digger drives his hoe up to the eye at every stroke. Hoe-ploughing in clay soils that have lain long under water, is indeed hard labour; but it will every year grow the lighter by being well drained by round-ridging: and in the meanwhile the labour may be rendered much more easy by the plough conducted by the lines above described. As therefore sandy mould is the best manure for stiff clay, so, by parity of reason, confirmed by long experience, stiff clay is the best manure for sandy or chaffy soils.

The method of round-ridging before described, is, by several years experience, found the most essential improvement of flat clayey soils: and yet there are some who will prefer speculation to ocular demonstration, fancying that all kinds of ridges will carry off the mould in heavy rains. The fact is otherwise in clay soils: and plain reason, without experience, vouches, that where great confluxes of water are divided into many small rills, the force is broken; and therefore less mould carried off the land. Another objection made to round ridgeing is, that by digging much clay to form the sides of the

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the ridge, the soil is impoverished: but this objection stands good only against those ridges which are raised too high, and made too broad; but if land is ridged in the manner before directed, that is, 12 feet broad, and not above six or eight inches higher in the middle than at the sides, the objection vanishes. Ridges were never proposed for light soils or steep lands; and even in flat soils upon loam they should be made with great caution, because *loam melts away by water*. But there are poachy lands of a white clay, even upon small descents, too retentive of water; these may certainly be improved much by ridges of 12 feet wide, as above described, without fear of washes.

But supposing, as the objection urges, that a little clay should be turned up at the sides of such ridges, can it not be manured somewhat more than the other parts with marle or sandy mould, so as to become equally good with any other part of the soil? And is not this well worth the labour, since round-ridging not only improves the soil by draining it to a surprising degree, but adds one-fifth part to the depth of the staple? And will not a ridge made a little rounding, throw off the water much better than a flat ridge?

The general maxim of not burning cane-trash (which may be called the *stubble of cane-lands*) upon any kind of soil, is surely a great mistake; as may be evinced by observing the contrary practice of the best husbandmen in England, where burn-baiting or bastard burn-baiting is found by experience an admirable method of fertilizing cold, stiff, or clayey lands. It must indeed be a constant practice, not only for the sake of contributing to warm and divide the soil, but as the only effectual means of destroying pernicious insects, and weeds of various kinds, such as French weed, wild pease, and wild vines.

Soon after the disuse of burning trash upon our land in the islands, the blast made its first appearance with incredible devastation: to revive that practice therefore seems to be the most obvious means of expelling it. It may be presumed that the disuse of burning trash was founded upon the mistaken notion of burn-baiting, which is turning up a thick sod of very dry, light, and shallow soils, and burning the whole superficies or staple to ashes. This practice the writers upon husbandry condemn universally, and very justly: for though by this practice the land will produce two or three crops more plentifully than ever, yet the soil is blown away by the wind, and the substratum being generally a hungry gravel or chalk, can never be restored to fertility by the common arts of husbandry. But surely this has no resemblance to our superficial burning of the little trash we can spare from dung: and though this method of burn-baiting light and shallow soils be justly condemned, yet the best writers recommend that very practice in cold, moist, and heavy soils, as is observed above; and long experience justifies it.

Deep mould upon clay or loam being subject to the grub worm (c), will not take any kind of dung, till perfectly rotten, except that of the sheep-fold; which is the best manure for all kinds of light soils, and is of all others the least expensive, as not requiring hand-labour. But the use of the fold is impracticable in any island not abounding with large savannas or sheep pastures, as in Jamaica.

Those soils therefore which are subject to the grub, and must be fertilized by common dung, which is a proper nest for the mother-beetle to deposite its eggs, must be well impregnated with the brine of dissolved salt, after the dung is first cut up; two large hogsheads of salt will make brine enough for a dung-pen of 50 feet square.

This cure for the grub is a late discovery; and which has been attended with success, so far as the experiment is made. But though it proves effectual to destroy that pernicious insect in plant-canes, it probably will not be sufficient to save rattoons, without a new application of salt in powder; because the first brine must be washed away by the time when rattoons spring up.

The planter who would save his rattoons from the grub ought therefore to cut off the heads of his stools with sharp hoes three inches below the surface of the soil, and then strew an handful of salt round each stool, and cover it up to a level with fine mould taken from the edges.

In soils where there is no grub, and the planter wishes to have very good rattoons, let him, as soon as his canes are cut, draw all the trash from the stools into the alternate spaces, if planted in that manner; or into the furrows, if his land be round-ridged; and then cut off the head of his stools with sharp hoes, as above directed. Experience has shown the advantage of this practice, and reason demonstrates the great benefit of the rattoon-sprouts rising from three inches below the surface, instead of superficial shoots which come to nothing, and only starve the strong sprouts. Besides, the stubs which are left upon the stools after the canes are cut, canker, and rot the stools; which is one reason why good rattoons are uncommon in soils long cultivated. Yet it is the opinion of some, that by hoe-ploughing and even dunging rattoons, the produce might be as good plant-canes, which would save the labour of holing and planting so often as planters commonly do.

Fallowing is of incredible advantage to every soil, not only by being divided into the minutest parts, but also by imbibing those vegetative powers with which the air is impregnated by the bountiful hand of Providence, whenever rain falls. What those powers are has been explained under the articles AGRICULTURE and PLANT; and experience evinces, that the tender vegetables of the earth are invigorated more by the smallest shower of rain, than by all the water which human art can bestow. Let it therefore be a constant maxim of the planter, never to plant his ground until the soil is well mellowed by fallowing, even though he bestows upon it a due proportion of dung: we say a due proportion; for too much will force up rank canes, which never yield good sugar; and though some advantage may be reaped from the rattoons,

(c) This pernicious insect is most apt to engender in dung made from mill-trash, which therefore never ought to be put into dung-compost or still ponds; but after being burnt, the ashes will be as good as any other kind. Round-ridging, with manure of unwet ashes, sea-sand, or lime, or dry marle, kills the grub.

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toons, yet it will be found by experience not to compensate the loss by the plants. In stony or steep soils, where the plough cannot be used, or where a sufficient strength of cattle cannot be supported for that purpose, hand-labour or hoe-ploughing must be substituted: but even in that case, much labour may be saved by spreading the dung according to the English husbandry, and digging it into the soil. To evince this truth, let any planter compute his negroes labour of distributing dung by baskets, and by spreading it with dung-forks; and then judge for himself by one single experiment which is the most profitable.

But if some planters are so devoted to the old custom of distributing dung by baskets instead of wheel-barrows in level ground, or hand-barrows in uneven land, by which three times the labour may be accomplished in the same time and by the same hands; let them at least save much of their hand-labour, by the following method of laying out dung, before the distribution by baskets.

In holing a piece of land, let a space be left after 80 holes from the first interval, and then the like space after 80 holes throughout the whole plat, which spaces must run exactly parallel to the intervals on the right and left of the holes. Into these spaces the dung may be carted, even before it be rotten (D), at the most leisure times, and covered with mould or cane-trash, to prevent exhalation; and in such quantity as will suffice only to dung a row of 40 holes, from the point opposite to each side of it. In the intervals at each side of the cane-piece, which are parallel to those spaces, there must be dung enough carted to manure a row of 40 holes, and covered in like manner.

By thus placing the dung or gut-mould, it is evident at the first sight, that the farthest distance cannot be above 40 holes in distributing the dung: and in case it be not sufficiently rotten for present use, it may be distributed even in dry weather, and covered by the bank; which will both prevent its spirit from exhalation, and occasion it to rot sooner, which is no small advantage. Moreover, by being thus laid out at the most leisure times, and covered with the banks, the dung will be more intimately mixed with the soil, and therefore continue to nourish the plant for a longer time than if laid as usual at the bottom of the holes. A farther advantage of thus distributing the dung, and covering it, results from the more expeditious planting the land after a short or sudden shower: for the labour of covering the dung, and uncovering it when the land is planted, however it may appear in speculation, is in practice a trifle; and besides all the other advantages arising by the distribution of dung from the spaces above described, this is not the least, that not a bank is trodden under foot. But it is evident, that by distributing the dung with baskets in the present method, the soil is much trampled under foot; and by that means, the very end of hoe-ploughing, or loosening the soil, is much defeated. In like manner, by the present method of hoe-ploughing, the same ill effect is produced; for as the negroes hoe-plough or dig the soil directly forward, so they must necessarily tread the ground as fast as they dig it: whereas by putting the labourers to dig sidewise, no one puts a foot upon the soil after it is dug; and by lining the land before it is hoe-ploughed, each negro may have an equal share to dig. The only difficulty of hoe-ploughing sidewise is in first setting the negroes to that work; but it may be done without loss of time when working in a contiguous field. Whether hoe-ploughing before or after the land be holed for canes is most eligible, experience must determine; but certainly both operations will be most effectual: and therefore it will be advisable (E), first to plough the soil where the land will admit the plough; and where it will not, to hoe-plough it with or without dung, as requisite; then let it lie fallow till perfectly mellowed; then hole and plant it; and instead of weeding in the usual manner, let the weeds in all the spaces be dug into the soil: but as this is not to be done so well with the hoe, it is submitted to future experience, whether the dexterous use of spades, as in England, will not answer the purpose much better, and with equal dispatch. But whatever method is preferred, most certain it is, that by loosening the soil in all the spaces between the young canes after being come up, their fibres will more easily expand on every side, and acquire more nutrition to invigorate their growth. But where the planter grudges this labour, by thinking it needless in a rich loose soil, he may dispatch more weeding-work by the Dutch hoe than by any other; which being fastened upon the end of a stick, is pushed forward under the roots of the small weeds, in such a manner as to cut them up a little below the surface of the soil, and will do more execution at one shove than can be done at three strokes of the common hoe: but there is yet another practice of the horse-hoe plough, whereby all weeds growing in rows between beans and pease, are extirpated with incredible ease and expedition. It is a very simple machine, drawn by one or two horses, consisting of a pair of low wheels turning upon a common axis; from whence two square irons are let down at equal distances, and triangular hoes made at the ends, the points of the triangles being placed forward, and so fixed as to cut all weeds an inch below the surface, in the same manner as the Dutch garden-hoe above-mentioned. By this machine a man and a boy, with two horses or mules, will clear perfectly all the spaces of a field of ten acres in two days, and may be of admirable use in all loose and dry soils in the sugar-islands: for while two horses or mules draw in the spaces before each other, the wheels pass on the outside of each row of canes, without doing the least injury, while the plough-

(D) In order to make dung rot the sooner, much labour is bestowed in digging and turning it over by hoes: but two-thirds of that labour may be saved by the use of hay-knives; six of which, used dexterously, will cut up a pen in less time than 60 negroes can do by hoes: but hay-knives cannot be used where gritty mould is employed in pens.

(E) Deep and loose soils may be ploughed with a small strength of cattle or mules: but stiff lands in hot climates require more strength of cattle than can be maintained in the small pastures of the planters; for if those strong soils are either too wet or too dry (as is generally the case), ploughing is impracticable.

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plough-holder attends to his businefs. In ftiff foils which require draining, neither the horfe-hoe plough nor the Dutch hoe can be proper; or any other inftrument fo effectual as the fpade ufed in the manner above hinted, where the ftaple is deep.

But where the ftaple of land is fhallow, care muft be taken not to dig much below it, according to the univerfal opinion of all the beft writers, fupported by the experience of 100 years. Yet fome good planters are fallen into the contrary practice, and dig up ftiff clay far below the ftaple. This, Mr Martin fays, was done in his own lands, during his abfence, by injudicioufly ploughing below the ftaple; and fo injured the foil, that all the arts of culture for many years hardly retrieved its former fertility. Indeed, where the ftaple is fhallow, upon a fat clay, the turning up a little of it at a time, from the bottom of the cane-holes, and mixing it with rich hot dung, made of marle, or fandy mould, which may take off its cohefive quality, will in due time, and by long fallow, convert it into good foil: but if ftiff clay be turned up, without any fuch mixture, in large quantities, it will infallibly difappoint the operator's hopes: for though folid clay will moulder, by expofure, to a feeming fine earth, yet it will return to its primitive ftate very foon after being wet, and covered from the external air, if not divided, as above fuggefted.

After all, the common horfe-hoeing plough drawn by two mules in a line before each other, or the hand-hoe in common ufe, will anfwer the purpofe very well, where the lands are planted in Mr Tull's method; that is, where the fpaces are equal to the land planted, in the following manner.

Suppofe fix feet planted in two rows of canes, and fix feet of land left as a fpace unplanted; and fo a whole piece of land, planted in alternate double rows (F), with equal fpaces, may be hoe-ploughed with eafe, as before hinted; and that at any time during the growth of canes, when it is moft convenient to the planter, which is a confiderable advantage; and yet it is the leaft of all attending this method of culture: for, by leaving thefe fpaces, the canes will have both more air and fun: by hoe-ploughing them, the roots of each double row will have large room for expanfion, and confequently, by gaining more nutriment, will grow more luxuriantly: by thefe fpaces the canes may be cleaned from the blaft with much more eafe and convenience; and will ferve as proper beds to plant great corn, without the leaft injury to the canes; as well as to contain the trafh taken off the land, where, by rotting, and being hoe-ploughed into the foil, it will wonderfully enrich it, and will fit it to be planted immediately after the canes in the neighbouring double rows are cut down. Befides all thefe admirable advantages of planting the land in alternate double rows with equal fpaces, the canes, when at full age, may be eafily ftripped of their trafh, and by that means the juice rendered fo mature as to yield double the produce, and much better fugars than unftripped canes. This method of culture may be recommended for all kinds of foil: for as by this practice the rank luxuriant canes will be more matured, fo the poor foils will be rendered more fruitful; and as the roots of the canes which expand into thefe fpaces will be kept moift by being covered with rotten trafh, fo they muft bear dry weather much longer in the burning foils. In thofe low lands which require draining by furrows, the alternate double rows and fpaces muft be made crofs the ridges; by which means thofe fpaces, being hoe-ploughed from the centre to the fides, will be always preferved in a proper ftate of roundnefs. By this method of planting, the canes may be fo well ripened as to yield double the quantity of fugar of canes planted in the clofe manner; which faves half the labour of cartage, half the time of grinding and boiling, and half the fuel, befides yielding finer fugar.

Yet, how well foever the method of planting in fingle or double alternate rows has fucceeded in the loofe and ftiff foils, experience has fhown that it is a wrong practice in ftiff lands that are thrown into round or flat ridges: for thefe being moft apt to crack, the fun-beams penetrate foon to the cane-roots, ftop their growth, and have an ill influence upon the fugar. It is therefore advifable to plant fuch lands full, but in large holes, of four feet, by five feet towards the banks: after the plant-canes are cut, to dig out one, and leave two rows ftanding, hoe-ploughing the fpaces after turning all the trafh into furrows till almoft rotten; for if the trafh is drawn upon the hoe-ploughed fpaces, they will hardly ever moulder, at leaft not till the trafh is quite rotten. This is an infallible proof from experience of how little advantage trafh is to the foil, unlefs it be in great droughts, to keep out the intenfe fun-beams: for, in all other refpects, it prevents that joint operation of the fun and air, in mouldering and fructifying the foil, as has been proved by repeated experiments.

But in flat ftiff foils that are properly drained by round-ridging, no culture prevents cracking fo effectually as hoe-ploughing into them a quantity of loofe marle, of which that of a chocolate or of a yellow colour is beft; and it will be ftill much better, by lying upon the land, in fmall heaps, or in cane-holes, for fome time, to imbibe the vegetative powers of the air before it is intimately mixed with the foil.

As to the manner of planting canes, the general practice of allowing four feet by five to a hole, and two frefh (G) plants, is found by common experience to be right and good in alternate rows. But the following precautions are neceffary to be obferved. Firft, let all the cane-rows run eaft and weft, that the trade-wind may pafs freely through them; becaufe air and funfhine are as conducive to the growth and maturation of fugar-canes as of any other vegetable. Secondly, let not any acceffion of mould be drawn into hills round the young canes, except where water ftagnates (H); becaufe the fibres which run horizontally, and near the furface, are much

(F) In ftiff lands, the fingle alternate rows of four feet diftance, as preventive of much labour in weeding, are found beft; and alfo yield more fugar by the acre; and are lefs apt to be affected by drought.

(G) It is an odd fancy that ftale plants grow beft, when both reafon and experience vouch that the moft fucculent plants are beft: one good plant in the centre of a large hole is fufficient when the land is full holed.

(H) The ftagnation of water in pools (ufual in ftiff level lands) is the moft injurious circumftance attending it; for

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much broken and spoiled by that practice. Thirdly, let the sugar-canes be cut at their full maturity: which, in a dry loose soil, is generally at the end of 14 or 15 months after being planted; but in cold clay-soils, not till 16 or 17 months. Fourthly, as the cane-rows run east and west in as proper a direction as possible for cartage to the sugar work, so canes must be cut the contrary way if the planter expects any great produce from his rattoons: for by beginning to cut canes at the part of his field most remote from the works, the carts cannot often pass over the same tract, and consequently the cane-stools cannot be injured, more especially if he takes due care to cut the canes very close to their roots; for, by leaving a long stub (which must perish) the cane-stools are much injured. It may be objected to the practice of cutting canes transversely to the rows, that the negroes labour will not be so equally divided: but let every man consider both sides of the question, and be determined by his own experience; and then he will be convinced, that it matters very little which way he cuts straight standing canes; but in cases where the sugar-canes lean, or are lodged by preceding high winds, it is a point of great importance to place the labourers so as to cut the canes first at the roots, and then, drawing them, cut off the tops: for thus by two strokes each cane will be cut; and twice the quantity cut in the same time, and by the same hands, more than by cutting in any other direction. In round-ridged land, it is proper to cut canes in the same direction of the ridges, throwing the tops and trash into the furrows to render the cartage easy, and to preserve the ridges in their proper form.

It is almost needless to suggest the expediency of planning the cane-pieces of a plantation in exact squares, so that the intervals may intersect at right angles; since such regularity is not only more beautiful, more safe in case of accidental fires, and a better disposition of the whole for dividing and planting one third or fourth part of a plantation every year, but also much easier guarded by a few watchmen: for one of these walking in a line from east to west, and the other from north to south, look through every avenue, where the most subtle thief cannot escape the watchful eye. And if the intervals surrounding the boundary of a regular plantation be made 24 feet wide, the proprietor will receive ample recompense for so much land, by the security of his canes from fires kindled in the neighbourhood, and by planting all that land in plantain-trees, which may at once yield food and shade to the watchmen, who by that means can have no excuse for absence from their proper stations. But as fuel grows very scarce in most of our islands, it is also expedient to plant a logwood or flower-fence in all the boundaries of every plantation, which, being cut every year, will furnish good store of faggots. Logwood makes the strongest and quickest of all fences, and agrees with every soil: the cuttings make excellent oven-fuel.

So much for the general operations of plantership, according to the approved directions of Mr Martin. For the particular cultivation of the sugar-canes, the extraction of the sugar, and the distillation of rum, see the articles SUGAR, and RUM.

Planter-ship, Planting.

PLANTING, in *Agriculture* and *Gardening*, is setting a tree or plant, taken from its proper place, in a new hole or pit; throwing fresh earth over its root, and filling up the hole to the level of the surface of the ground.

The first thing in planting is to prepare the ground before the trees or plants are taken out of the earth, that they may remain out of the ground as short a time as possible; and the next is, to take up the trees or plants, in order to their being transplanted. In taking up the trees, carefully dig away the earth round the roots, so as to come at their several parts to cut them off; for if they are torn out of the ground without care, the roots will be broken and bruised, to the great injury of the trees. When you have taken them up, the next thing is to prepare them for planting by pruning the roots and heads. And first, as to the roots; all the small fibres are to be cut off, as near to the place from whence they are produced as may be, except they are to be replanted immediately after they are taken up. Then prune off all the bruised or broken roots, all such as are irregular and cross each other, and all downright roots, especially in fruit-trees: shorten the larger roots in proportion to the age, the strength, and nature of the tree; observing that the walnut, mulberry, and some other tender-rooted kinds should not be pruned so close as the more hardy sorts of fruit and forest trees: in young fruit-trees, such as pears, apples, plums, peaches, &c. that are one year old from the time of their budding or grafting, the roots may be left only about eight or nine inches long; but in older trees, they must be left of a much greater length: but this is only to be understood of the larger roots; for the small ones must be chiefly cut quite out, or pruned very short. The next thing is the pruning of their heads, which must be differently performed in different trees; and the design of the trees must also be considered. Thus, if they are designed for walls or espaliers, it is best to plant them with the greatest part of their heads, which should remain on till they begin to shoot in the spring, when they must be cut down to five or six eyes, at the same time taking care not to disturb the roots. But if the trees are designed for standards, you should prune off all the small branches close to the place where they are produced, as also the irregular ones which cross each other; and after having displaced these branches, you should also cut off all such parts of branches as have by any accident been broken or wounded; but by no means cut off the main leading shoots which are necessary to attract the sap from the root, and thereby promote the growth of the tree. Having thus prepared the trees for planting, you must now proceed to place them in the earth: but first, if the trees have been long out of the ground, so that the fibres of the roots are dried, place them eight or ten hours in water, before they are planted, with their heads erect, and the roots only immersed therein;

 which

for that, by long duration, will convert the finest mould into stiff clay. The proprietor of such a soil must therefore grudge no labour to drain it well; and yet by such easy gradation as to prevent the mould from being washed away by great floods, in case the under stratum be a loam.

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which will swell the dried vessels of the roots, and prepare them to imbibe nourishment from the earth. In planting them, great regard should be had to the nature of the soil: for if that be cold and moist, the trees should be planted very shallow; and if it be a hard rock or gravel, it will be better to raise a hill of earth where each tree is to be planted, than to dig into the rock or gravel, and fill it up with earth, as is too often practised, by which means the trees are planted as it were in a tub, and have but little room to extend their roots. The next thing to be observed is, to place the trees in the hole in such a manner that the roots may be about the same depth in the ground as before they were taken up; then break the earth fine with a spade, and scatter it into the hole, so that it may fall in between every root, that there may be no hollowness in the earth: then having filled up the hole, gently tread down the earth with your feet, but do not make it too hard; which is a great fault, especially if the ground be strong or wet. Having thus planted the trees, they should be fastened to stakes driven into the ground to prevent their being displaced by the wind, and some mulch laid upon the surface of the ground about their roots; as to such as are planted against walls, their roots should be placed about five or six inches from the wall, to which their heads should be nailed to prevent their being blown up by the wind. The seasons for planting are various, according to the different sorts of trees, or the soil in which they are planted. For the trees whose leaves fall off in winter, the best time is the beginning of October, provided the soil be dry; but if it be a very wet soil, it is better to defer it till the latter end of February, or the beginning of March: and for many kinds of evergreens, the beginning of April is by far the best season; though they may be safely removed at midsummer, provided they are not to be carried very far; but should always make choice of a cloudy wet season.

In the second volume of the papers, &c. of the Bath Society there is a letter on planting waste grounds. The gentleman who writes it informs us, that in the county of Norfolk, where he resides, there were about 60 or 70 years ago vast tracts of uncultivated ground, which were then thought totally barren. "The western parts of it (says he) abounded with sand of so light a texture, that they were carried about by every wind; and in many places the sands were so loose that no grass could grow upon them. Art and industry, however, have now so altered the face of this once Arabian desert, that it wears a very different appearance. Most of these tracts are either planted or rendered very good corn-land and sheep-walks.

"About 30 years since, the sides of many of our little sand-hills were sown with the seeds of French furze, and when a wet season followed, they succeeded very well, and grew so fast, that once in three or four years they are cut for fuel, and sell at a good price at Thetford, Brandon, Harling, Swaffham, and places adjacent. This excited some public-spirited gentlemen, among whom was the late Mr Buxton of Shadwell-Lodge, near Thetford, to attempt the planting of Scotch and spruce firs, and other hardy forest-trees. At first they found some difficulty from the extreme looseness of the sand. But as there is in all this part of the country fine white and yellow marle, at about three feet depth below the sand, they very judiciously thought that incorporating it with the sand in the holes where their young trees were planted, would insure success; nor were they disappointed. The method succeeded beyond expectation; the plantations throve exceedingly, and the roots soon reached below the sand, after which they were out of danger. This excited them to further attempts.

"On the spots where they intended to raise new plantations from seeds and acorns, they laid on a thick coat of marle and clay, which after being rough spread, and lying a winter in that state, was made fine, and ploughed in just before planting. By these means the soil became fixed, and in a little time covered with grass and herbage; so that there are now vast plantations of firs, oak, and forest-trees, in the most healthy and vigorous state, where within my memory ten acres of land would not maintain a single sheep three months.

"But the benefit of plantations, whether of shrubs, copse, or trees, is not confined to the immediate advantage, or even the future value of the wood. By annually shedding a great number of leaves, which the winds disperse, and the rains wash into the soil, it is considerably improved; and whenever such copses have been stubbed up, the ground (however unfruitful before planting) has thereby been so enriched as to bear excellent crops for many years, without the additional help of manure. How much land-owners are interested in planting waste or barren spots I need not mention; and nothing but a degree of indolence or ignorance unpardonable in this enlightened age could induce them to neglect it.

"Nature has furnished us with plants, trees, and shrubs, adapted to almost every soil and situation; and as the laws of vegetation are now much better understood than formerly, it is a reproach to those whose practice does not keep pace with their knowledge in making the best use of her bounty. Let no man repine and say *the land is barren*; for those spots which appear to be so, owe that appearance to human negligence. Industry and art might soon render an eighth part of this kingdom nearly as valuable as the rest, which now remains in a state unprofitable to the owners, and disgraceful to the community."

Reverse PLANTING, a method of planting in which the natural position of the plant or shoot is inverted; the branches being set into the earth, and the root reared into the air. Dr Agricola mentions this monstrous method of planting, which he found to succeed very well in most or all sorts of fruit-trees, timber-trees, &c. Bradley affirms, that he has seen a lime-tree in Holland growing with its first roots in the air, which had shot out branches in great plenty, at the same time that its first branches produced roots and fed the tree. Mr Fairchild of Hoxton has practised the same with us, and gives the following directions for performing it: Make choice of a young tree of one shoot, of alder, elm, willow, or any other tree that easily takes root by laying; bend the shoot gently down into the earth, and so let it remain until it has taken root. Then dig about the first root, and raise it gently out of the ground, till the stem be nearly upright, and stake it up. Then prune the roots, now erected in the air, from the bruises and wounds they received in being dug up; and anoint the pruned parts with a composition of two ounces of turpentine, four ounces of tallow, and four ounces of bees wax, melted together, and applied pretty warm. Afterwards

terwards prune off all the buds or ſhoots that are upon the ſtem, and dreſs the wounds with the ſame compoſition, to prevent any collateral ſhootings, that might ſpoil the beauty of the ſtem.

PLANUDES, Maximus, a Greek monk of Conſtantinople, towards the end of the 14th century, who publiſhed a collection of epigrams intitled *Anthologia;* a Greek tranſlation of Ovid's Metamorphoſes; a Life of Æſop, which is rather a romance than a hiſtory; and ſome other works. We know nothing more of him, than that he ſuffered ſome perſecution on account of his attachment to the Latin church.

PLASHING *of* Hedges, is an operation thought by ſome perſons to promote the growth and continuance of old hedges; but whether the fact be ſo or not will admit of ſome diſpute. See Hedges.

It is performed in this manner: The old ſtubs muſt be cut off, &c. within two or three inches of the ground; and the beſt and longeſt of the middle-ſized ſhoots muſt be left to lay down. Some of the ſtrongeſt of theſe muſt alſo be left to anſwer the purpoſe of ſtakes. Theſe are to be cut off to the height at which the hedge is intended to be left; and they are to ſtand at ten feet diſtance one from another: when there are not proper ſhoots for theſe at the due diſtances, their places muſt be ſupplied with common ſtakes of dead wood. The hedge is to be firſt thinned, by cutting away all but thoſe ſhoots which are intended to be uſed either as ſtakes, or the other work of the plaſhing: the ditch is to be cleaned out with the ſpade; and it muſt be now dug as at firſt, with ſloping ſides each way; and when there is any cavity on the bank on which the hedge grows, or the earth has been waſhed away from the roots of the ſhrubs, it is to be made good by facing it, as they expreſs it, with the mould dug from the upper part of the ditch: all the reſt of the earth dug out of the ditch is to be laid upon the top of the bank: and the owner ſhould look carefully into it that this be done; for the workmen, to ſpare themſelves trouble, are apt to throw as much as they can upon the face of the bank; which being by this means overloaded, is ſoon waſhed off into the ditch again, and a very great part of the work undone; whereas what is laid on the top of the bank always remains there, and makes a good fence of an indifferent hedge.

In the plaſhing the quick, two extremes are to be avoided; theſe are the laying it too low, and the laying it too thick. The latter makes the ſap run all into the ſhoots, and leaves the plaſhes without ſufficient nouriſhment; which, with the thickneſs of the hedge, finally kills them. The other extreme of laying them too high, is equally to be avoided; for this carries up all the nouriſhment into the plaſhes, and ſo makes the ſhoots ſmall and weak at the bottom, and conſequently the hedge thin. This is a common error in the north of England. The beſt hedges made anywhere in England are thoſe in Hertfordſhire; for they are plaſhed in a middle way betwen the two extremes, and the cattle are by that prevented both from cropping the young ſhoots, and from going through; and a new and vigorous hedge ſoon forms itſelf.

When the ſhoot is bent down that is intended to be plaſhed, it muſt be cut half way through with the bill: the cut muſt be given ſloping, ſomewhat downwards, and then it is to be wound about the ſtakes, and after this its ſuperfluous branches are to be cut off as they ſtand out at the ſides of the hedge. If for the firſt year or two, the field where a new hedge is made can be ploughed, it will thrive the better for it; but if the ſtubs are very old, it is beſt to cut them quite down, and to ſecure them with good dead hedges on both ſides, till the ſhoots are grown up from them ſtrong enough to plaſh; and wherever void ſpaces are ſeen, new ſets are to be planted to fill them up. A new hedge raiſed from ſets in the common way, generally requires plaſhing in about eight or nine years after.

PLASSEY, is a grove near the city of Muxadab in India, famous for a battle fought between the Engliſh under Lord Clive, and the native Hindoos under the nabob Surajah Dowlah. The Britiſh army conſiſted of about 3200 men, of whom the Europeans did not exceed 900; while that of the nabob conſiſted of 50,000 foot, and 18,000 horſe. Notwithſtanding this great diſproportion, however, Lord Clive effectually routed the nabob and his forces, with the loſs of three Europeans and 26 Seapoys killed, and five Europeans and 40 Seapoys wounded. The nabob's loſs was eſtimated at about 200 men, beſides oxen and elephants. See Clive.

PLASTER, or Emplaster, in *Pharmacy*, an external application of a harder conſiſtence than an ointment; to be ſpread, according to the different circumſtances of the wound, place, or patient, either upon linen or leather.

Plaster, or *Plaiſter*, in building, a compoſition of lime, ſometimes with ſand, &c. to parget, or cover the nudities of a building. See Pargeting and Stucco.

PLASTER of Paris, a preparation of ſeveral ſpecies of gypſum dug near Mount Martre, a village in the neighbourhood of Paris; whence the name. See Alabaster, Gypsum, and Sulphate of Lime, under Chemistry.

The beſt ſort is hard, white, ſhining, and marbly; known by the name of *plaſter-ſtone* or *parget of Mount Martre*. It will neither give fire with ſteel, nor ferment with aquafortis; but very freely and readily calcines in the fire into a fine plaſter, the uſe of which in building and caſting ſtatues is well known.

The method of repreſenting a face truly in plaſter of Paris is this: The perſon, whoſe figure is deſigned, is laid on his back, with any convenient thing to keep off the hair. Into each noſtril is conveyed a conical piece of ſtiff paper, open at both ends, to allow of reſpiration. Theſe tubes being anointed with oil, are ſupported by the hand of an aſſiſtant; then the face is lightly oiled over, and the eyes being kept ſhut, alabaſter freſh calcined, and tempered to a thinniſh conſiſtence with water, is by ſpoonfuls nimbly thrown all over the face, till it lies near the thickneſs of an inch. This matter grows ſenſibly hot, and in about a quarter of an hour hardens into a kind of ſtony concretion; which being gently taken off, repreſents, on its concave ſurface, the minuteſt part of the original face. In this a head of good clay may be moulded; and therein the eyes are to be opened, and other neceſſary amendments made. This ſecond face being anointed with oil, a ſecond mould of calcined alabaſter is made, conſiſting of two parts joined lengthwiſe

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lengthwiſe along the ridge of the noſe; and herein may be caſt, with the ſame matter, a face extremely like the original.

If finely powdered alabaſter, or plaſter of Paris, be put into a baſon over a fire, it will, when hot, aſſume the appearance of a fluid, by rolling in waves, yielding to the touch, ſteaming, &c. all which properties it again loſes on the departure of the heat; and being thrown upon paper, will not at all wet it, but immediately diſcover itſelf to be as motionleſs as before it was ſet over the fire; whereby it appears, that a heap of ſuch little bodies, as are neither ſpherical nor otherwiſe regularly ſhaped, nor ſmall enough to be below the diſcernment of the eye, may, without fuſion, be made fluid, barely by a ſufficiently ſtrong and various agitation of the particles which compoſe it; and moreover loſe its fluidity immediately upon the ceſſation thereof.

Two or three ſpoonfuls of burnt alabaſter, mixed up thin with water, in a ſhort time coagulate, at the bottom of a veſſel full of water, into a hard lump, notwithſtanding the water that ſurrounded it. Artificers obſerve, that the coagulating property of burnt alabaſter will be very much impaired or loſt, if the powder be kept too long, eſpecially if in the open air, before it is made uſe of; and when it hath been once tempered with water, and ſuffered to grow hard, they cannot, by any burning or powdering of it again, make it ſerviceable for their purpoſe as before.

This matter, when wrought into veſſels, &c. is ſtill of ſo looſe and ſpongy a texture, that the air has eaſy paſſage through it. Mr Boyle gives an account, among his experiments with the air-pump, of his preparing a tube of this plaſter, cloſed at one end and open at the other; and on applying the open end to the cement, as is uſually done with the receivers, it was found utterly impoſſible to exhauſt all the air out of it; for freſh air from without preſſed in as faſt as the other, or internal air, was exhauſted, though the ſides of the tube were of a conſiderable thickneſs. A tube of iron was then put on the engine; ſo that being filled with water, the tube of plaſter of Paris was covered with it; and on uſing the pump, it was immediately ſeen, that the water paſſed through into it as eaſily as the air had done, when that was the ambient fluid. After this, trying it with Venice turpentine inſtead of water, the thing ſucceeded very well; and the tube might be perfectly exhauſted, and would remain in that ſtate ſeveral hours. After this, on pouring ſome hot oil upon the turpentine, the caſe was much altered; for the turpentine melting with this, that became a thinner fluid, and in this ſtate capable of paſſing like water into the pores of the plaſter. On taking away the tube after this, it was remarkable that the turpentine, which had pervaded and filled its pores, rendered it tranſparent, in the manner that water gives tranſparency to that ſingular ſtone called *oculus mundi*. In this manner, the weight of air, under proper management, will be capable of making ſeveral ſorts of glues penetrate plaſter of Paris; and not only this, but baked earth, wood, and all other bodies, porous enough to admit water on this occaſion.

Plaſter of Paris is uſed as a manure in Pennſylvania, as we find mentioned in a letter from a gentleman in that country inſerted in the 5th volume of the Bath Society Papers, and which we ſhall inſert here for the ſatisfaction and information of our agricultural readers. "The beſt kind is imported from hills in the vicinity of Paris: it is brought down the Seine, and exported from Havre de Grace. I am informed there are large beds of it in the bay of Fundy, ſome of which I have ſeen nearly as good as that from France; nevertheleſs ſeveral cargoes brought from thence to Philadelphia have been uſed without effect. It is probable this was taken from the top of the ground, and by the influence of the ſun and atmoſphere diſpoſſeſſed of the qualities neceſſary for the purpoſes of vegetation. The lumps compoſed of flat ſhining ſpecula are preferred to thoſe which are formed of round particles like ſand: the ſimple method of finding out the quality is to pulverize ſome, and put it dry into an iron pot over the fire, when that which is good will ſoon boil, and great quantities of the fixed air eſcape by ebullition. It is pulverized by firſt putting it in a ſtamping-mill. The finer its pulverization the better, as it will thereby be more generally diffuſed.

Plaſter.

"It is beſt to ſow it in a wet day. The moſt approved quantity for graſs is ſix buſhels per acre. No art is required in ſowing it more than making the diſtribution as equal as poſſible on the ſward of graſs. It operates altogether as a top manure, and therefore ſhould not be put on in the ſpring until the principal froſts are over and vegetation hath begun. The general time for ſowing with us is in April, May, June, July, Auguſt, and even as late as September. Its effects will generally appear in 10 or 15 days; after which the growth of the graſs will be ſo great as to produce a large burden at the end of ſix weeks after ſowing.

"It muſt be ſown on dry land, not ſubject to be overflown. I have ſown it on ſand, loam, and clay, and it is difficult to ſay on which it has beſt anſwered, although the effect is ſooner viſible on ſand. It has been uſed as a manure in this ſtate for upwards of 12 years. Its duration may, from the beſt information I can collect, be eſtimated from 7 to 12 years; for, like other manure, its continuance very much depends on the nature of the ſoil on which it is placed.

"One of my neighbours ſowed ſome of his graſs ground ſix years ago, another four years ago; a great part of my own farm was ſown in May 1788. We regularly mow two crops, and paſture in autumn; no appearance of failure, the preſent crop being full as good as any preceding. I have this ſeaſon mowed 50 acres of red clover, timothy graſs, white clover, &c. which was plaſtered laſt May, July, and September: many who ſaw the graſs eſtimated the produce at two tons per acre, but I calculate the two crops at three tons. Several ſtripes were left in the different fields without plaſter; theſe were in a meaſure unproductive, being ſcarcely worth mowing. In April 1788, I covered a piece of graſs land upwards of two inches thick with barn manure; in the ſame worn-out field I ſowed plaſter, to contraſt it with the dung. I mowed the dunged and plaſtered land twice laſt year and once this; in every crop the plaſter has produced the moſt. You will remember, in all experiments with clover, to mix about one-third timothy graſs ſeed; it is of great advantage in ſerving as a ſupport for the clover; it very much facilitates the curing of clover, and when cured is a ſuperior fodder. The plaſter operates equally as well on the other graſſes as on clover. Its effect is ſaid to be good on wheat, if ſown in the ſpring; but I cannot ſay this from experience. On Indian corn I know its operation

to be great; we use it at the rate of a table spoonful for a hill, put in immediately after dressing.

"From some accurate experiments last year made and reported to our Agricultural Society, it appears that nine bushels of additional corn per acre were produced by this method of using plaster."

PLASTERING. See PARGETTING.

PLASTIC, denotes a thing endowed with a formative power, or a faculty of forming or fashioning a mass of matter after the likeness of a living being.

PLASTIC Nature, a certain power, by which, as an instrument, many philosophers, both ancient and modern, have supposed the great motions in the corporeal world, and the various processes of generation and corruption, to be perpetually carried on.

Among the philosophers of Greece, such a power was almost universally admitted. It seems, indeed, to have been rejected only by the followers of Democritus and Epicurus, who talk as if they had thought gravity essential to matter, and the *fortuitous* motion of atoms, which they held to have been from eternity, the source not only of all the *regular* motions in the universe, but also of the *organization* of all corporeal systems, and even of *sensation* and *intellection*, in brutes and in men. It is needless to say, that those men, whatever they might profess, were in reality atheists; and Democritus, it is universally known, avowed his atheism.

The greater part of the philosophers who held the existence of a plastic nature, considered it not as an *agent* in the strict sense of the word, but merely as an instrument in the hand of the Deity; though even among them there were some who held no superior power, and were of course as gross atheists as Democritus himself. Such was *Strato* of Lampsacus. This man was originally of the peripatetic school, over which he presided many years, with no small degree of reputation for learning and eloquence. He was the first and chief assertor of what has been termed *Hylozoic atheism*; a system which admits of no power superior to a certain *natural* or *plastic life*, *essential*, *ingenerable*, and *incorruptible*, inherent in matter, but without sense and consciousness. That such was his doctrine we learn from Cicero, who makes *Velleius* the Epicurean say, "Nec audiendus *Strato* qui *Physicus* appellatur, qui omnem vim divinam in Natura sitam esse censet, quæ causas gignendi, augendi, minuendive habeat, sed careat omni sensu *." That Strato in admitting this plastic principle, differed widely from Democritus, is apparent from the following account of him by the same author: *Strato Lampsacenus* negat opera deorum se uti ad fabricandum mundum, quæcunque sint docet omnia esse effecta *naturæ*, nec ut ille, qui asperis, et levibus, et hamatis uncinatisque corporibus concreta hæc esse dicat, interjecta inani; somnia censet hæc esse *Democriti*, non docentis sed optantis †."

* *De Natura Deorum*, lib. i. cap. 13.

† *Acad. Quæst.* lib. iv. cap. 38.

That the rough and smooth, and hooked and crooked, atoms of Democritus, were indeed dreams and dotages, is a position which no man will controvert; but surely Strato was himself as great a dreamer when he made sensation and intelligence result from a certain plastic or spermatic life in matter, which is itself devoid of sense and consciousness. It is, indeed, inconceivable, to use the emphatic language of Cudworth, "how any one in his senses should admit such a monstrous paradox as this, that every atom of dust has in itself as much wisdom as the greatest politician and most profound philosopher, and yet is neither conscious nor intelligent!" It is to be observed of Strato likewise, that though he attributed a certain kind of life to matter, he by no means allowed of one common life as ruling over the whole material universe. He supposed the several parts of matter to have so many several plastic lives of their own, and seems ‡ to have attributed something to chance in the production and preservation of the mundane system.

‡ *Cud. Int. Syst. ed. Moshem*, lib. i. cap. 3.

In denying the existence of a God, perpetually directing his plastic principle, and in supposing as many of these principles as there are atoms of matter, Strato deviated far from the doctrine of Aristotle. The great founder of the peripatetic school, as well as his apostate disciple, taught that mundane things are not effected by fortuitous mechanism, but by such a *nature* as acts regularly and artificially for *ends*; yet he never considers this *nature* as the highest principle, or supreme *Numen*, but as subordinate to a perfect mind or intellect; and he expressly affirms, that "*mind*, together with *nature*, formed or fashioned this universe." He evidently considers mind as the principal and intelligent agent, and nature as the subservient and executive instrument. Indeed, we are strongly inclined to adopt the opinion of the learned Mosheim, who thinks that by nature Aristotle meant nothing more than that θερμοτης ψυχικη, or *animal heat*, to which he attributes immortality, and of which he expressly says § that all things are full. Be this as it may, he always joins God and nature together, and affirms that they do nothing in vain. The same doctrine was taught before him by Plato, who affirms that "nature, together with reason, and according to it, orders all things." It must not, however, be concealed, that Plato seems to have attributed intelligence to the principle by which he supposed the world to be animated; for Chalcidius, commenting on the Timæus ‡, thus expresses himself: "Hæc est illa *rationabilis* anima mundi, quæ gemina juxta meliorem naturam veneratione tutelam præbet inferioribus, divinis dispositionibus obsequens, providentiam nativis impertiens, æternorum similitudine propter cognationem beata."—Apuleius too, tells us ||, "Illam cœlestem animam, fontem animarum omnium, optimam virtutem esse genetricem, subserviri etiam Fabricatori Deo, et præsto esse ad omnia inventa ejus." *Plato pronunciat.*

§ *De Generatione Animal.* lib. iii. cap. 11.

‡ Sect. 53.

|| *De Dogmate Platonis.*

The doctrine of Plato has been adopted by many moderns of great eminence both for genius and for learning. The celebrated Berkeley bishop of Cloyne, after giving the view of Plato's *anima mundi*, which the reader will find in our article MOTION, N° 10, thus recommends the study of his philosophy *: "If that philosopher himself was not read only, but studied also with care, and made his own interpreter, I believe the prejudice that now lies against him would soon wear off, or be even converted into high esteem, for those exalted notions, and fine hints, that sparkle and shine throughout his writings; which seem to contain not only the most valuable learning of Athens and Greece, but also a treasure of the most remote traditions and early science of the east." Cudworth, and the learned author of *Ancient Metaphysics*, are likewise strenuous advocates for the Aristotelian doctrine of a plastic nature diffused through the material world; (See METAPHYSICS, N° 200, 201, 202.): and a notion very similar has lately occurred

* *Siris*, N° 338.

Plastic. occurred to a writer who does not appear to have borrowed it either from the *Lyceum* or the *Academy*.

This writer is Mr Young, of whose *active substance*, and its agency in moving bodies, some account has been given elsewhere, (see MOTION). As a mere unconscious agent, *immaterial*, and, as he expresses himself, *immental*, it bears a striking resemblance to the *plastic nature* or *vegetable life* of Cudworth: but the author holds it to be not only the principle of motion, but also the *basis* or *substratum* of matter itself; in the production of which, by certain motions, it may be said to be more strictly *plastic* than the *hylarchical* principle, or *vis genitrix*, of any other philosopher with whose writings we have any acquaintance. Though this opinion be singular, yet as its author is evidently a man who thinks for himself, unawed by the authority of celebrated names, and as one great part of the utility of such works as ours consists in their serving as indexes to science and literature, we shall lay before our readers a short abstract of the reasonings by which Mr Young endeavours to support his hypothesis, and we shall take the liberty of remarking upon those reasonings as we proceed.

The author, after a short introduction, enters upon his work ‡, in a chapter intitled, *Analysis of Matter in general*. In that chapter there is little novelty. He treats, as others have done, of primary and secondary qualities, and adheres too closely to the language of Locke, when he says, that "the nature of bodies signifies the aggregate of all those *ideas* with which they furnish us, and by which they are made known." To say the best of it, this sentence is inaccurately expressed. An aggregate of *ideas* may be occasioned by the impulse of bodies on the organs of sense, but the effect of impulse cannot be that which impels. We should not have made this remark, which may perhaps be deemed captious, were we not persuaded that the vague and inaccurate use of terms is the source of those mistakes into which, we cannot help thinking, that the very ingenious author has sometimes fallen. Having justly observed, that we know nothing directly of bodies but their qualities, he proceeds to investigate the nature of solidity.

‡ *An Essay on the powers and mechanism of nature.*

"Solidity (he says) is the quality of body which principally requires our notice. It is that which fills extension, and which resists other solids, occupying the place which it occupies; thus making extension and figure real, and different from mere space and vacuity. If the secondary qualities of bodies, or their powers variously to affect our senses, depend on their primary qualities, it is chiefly on this of solidity; which is therefore the most important of the primary qualities, and that in which the essence of body is by some conceived to consist. This idea of solidity has been judged to be incapable of any analysis; but it appears evident to me (continues our author), that the idea of solidity may be resolved into another idea, which is that of the power of resisting within the extension of body. Hence it becomes unnecessary, and even inadmissible, to suppose that solidity in the body is at all a pattern or archetype of our sensation."

That solidity in the body, and we know nothing of solidity any where else, is no pattern of any sensation of ours, is indeed most true, as we have shown at large in another place, (see METAPHYSICS, N° 44 and 171): but to reconcile this with what our author asserts immediately afterwards, that "solidity is no more in bodies than colours and flavours are, and that it is equally with them a *sensation* and an *idea*," would be a task to which our ingenuity is by no means equal. He affirms, indeed, that solidity, as it is said to be in bodies, is utterly incomprehensible; that we can perfectly comprehend it as a sensation in ourselves, but that in bodies nothing more is required than a power of active resistance to make upon our senses those impressions from which we infer the reality of primary and secondary qualities. This power of resistance, whether it ought to be called active or passive, we apprehend to be that which all other philosophers have meant by the word *solidity*; and though Locke, who uses the words *idea* and *notion* indiscriminately, often talks of the *idea* of solidity, we believe our author to be the first of human beings who has thought of treating *solidity* as a sensation in the mind.

Though it is wrong to innovate in language, when writing on subjects which require much attention, we must, however, acknowledge it to be unworthy of inquirers after truth to dispute about the proper or improper use of terms, so long as the meaning of him who employs them can be easily discovered. We shall, therefore, follow our author in his endeavours to ascertain what this power of resistance is which is commonly known by the name of solidity. All power, he justly holds to be active; and having, by an argument (A) of which

(A) We can only conceive of solidity as being a resistance of the *parts* of any body, to a power which endeavours to *separate* them, or to bring them *nearer* together. Now that which resists any power, and prevents its effect, is also a power. By resistance, I mean here an active resistance, such as an animal can employ against an animal. If a horse pulls against a load, he draws it along; but if he draws against another horse, he is put to a stand, and his endeavour is defeated. When any endeavour to change the situation of the parts of any solid is in like manner prevented from taking effect, and the parts retain their situation, the situation has plainly been preserved by an active resistance or power, equivalent to that which was fruitlessly exerted on them."

Such is our author's reasoning to prove that matter is essentially active, and that from this activity results our notion of its solidity: but does he not here confound solidity with hardness, and impenetrability with cohesion? He certainly does; for *water* is as *solid*, in the proper sense of the word, as *adamant*; and the particles of *air* as the particles of *iron*. The parts of water are, indeed, separated with ease, and those of adamant with difficulty; but it is not because the latter have more solidity than the former, but because the power of cohesion, whatever it may be, operates upon them with greater force. Solidity is an attribute of a whole; hardness and softness result from the cohesion of parts. We do not at all perceive the propriety of the simile of the horse pulling a load, and afterwards pulling against another horse. Is it because both horses are *active* that one of them cannot prevail against the other, and because the load is *inactive* that either of them may drag along a mass of iron of half a ton weight? If

Plastic.

which we do not perceive the force, attempted to prove that it is by an inward *power*, and not by its *inertia*, that one body prevents another from occupying the same place with itself, he naturally enough infers matter to be essentially active. "But the activity of matter is to be considered in a certain limited sense, and its inertness is to be regarded in another limited sense; so that these are compatible within their respective limits. The activity of body may be considered as belonging to the parts of a compound; its inertia as the inertia formed of those parts. The actions of the parts are everywhere opposed to each other, and equal; and hence results the inactivity of the whole."*

SOLIDITY alone of the primary qualities being positive, and peculiar to bodies, and our author having resolved this into ACTION or POWER, it follows, by his analysis, that the ESSENCE OF BODY is reduced to power likewise. But, as he properly observes, power is an idea of reflection, not acquired by the senses, but suggested by thought. Hence our knowledge of real existence in body must be such as is suggested to us by our thoughts exercised about our sensations. "We are capable of acting and producing changes in appearances; and this faculty, which we experience to exist in ourselves, we call power. We are conscious of the exertion of our own power; and, therefore, when we see ACTION or CHANGE happen without any exertion of ours, we refer this to other powers without us, and necessarily conclude the POWER to exist where the change begins or the action is exerted. This power, then, referred to bodies, must exist in them, or it can exist no where."

In two chapters, which might easily have been compressed into one not so long as the shortest of them, our author analyzes *atoms* or the primary particles of matter, and strenuously opposes their impenetrability. He allows that there are atoms of matter not divisible by any known force; but as these, however small, must still be conceived as having extension, each of them must be composed of parts held together by the same power which binds together many atoms in the same body. This power, indeed, he acknowledges to operate much more forcibly when it cements the parts of a primary atom than when it makes many atoms cohere in one mass; but still it operates in the same manner: and as the ideal analysis may be carried on *ad infinitum*, the only positive idea which is suggested by atoms, or the parts of atoms, is the idea of a resisting power. That this power of resistance, which constitutes what is vulgarly called the solidity of bodies, may not be absolutely impenetrable, he attempts to prove, by showing that resistance does in fact take place in cases where impenetrability, and even solidity, are not supposed by any man.

"Let us endeavour (says he) to bring together two like poles of a magnet, and we shall experience a resistance to their approximation. Why, then, may not a piece of iron, which between our fingers resists their coming together, resist by an efficacy perfectly similar, though more strongly exerted? If magnetism were to act upon our bodies as upon iron, we should feel it; or were magnets endowed with sensation, they would feel that which resists their nearer approach. The resisting extension between the two magnets is permeable to all the rays of light, and reflecting none is therefore unseen; but it is easy to conceive that the same power which resists the approach of the iron might resist and reflect some rays of light. We should then have a visible object interposed between the two magnets, as we have before supposed it might be a tangible one. It is likewise easy to conceive that which is tangible and visible so applied to our organs of tasting, of smelling, and of hearing, as to excite ideas of flavours, odours, and sounds. Thus we see that an action, in which no supposition of solidity or impenetrability is involved, may be conceived to assume all the qualities of matter, by only supposing a familiar effect extended in its operation."

This reasoning is exceedingly ingenious, though perhaps not original; but what is of more importance, it does not approach so near to demonstration as the author seems to imagine. If magnets operate by means of a fluid issuing from them (see MAGNETISM), those who hold the solidity or impenetrability of matter will maintain, that each atom of the magnetic fluid is solid and impenetrable. That we do not see nor feel these atoms, will be considered as no argument that they do not exist; for we do not see, nor in a close room feel, the atoms of the surrounding atmosphere; which yet Mr Young will acknowledge to have a real existence, and to be capable of operating upon our senses of hearing and smelling. Let us, however, suppose, that by this reasoning he has established the non-existence of every thing in the primary atoms of matter but active powers of resistance, and let us see how he conceives the actions of these powers to constitute what gives us the notion of inert and solid body; for that we have such a notion cannot be denied.

To ACT he allows to be an attribute, and justly observes, that we cannot conceive an attribute to exist without a substance. "But (says he) we have traced all phenomena to action as to a generic idea, comprehending under it all forms of matter and motion as species of that genus. By this analysis, that complex idea we have usually denominated matter, and considered as the substance or substratum to which motion appertained as an attribute, is found to change its character, and to be itself an attribute of a substance essentially active, of which one modification of motion produces matter and another generates motion." The action of this substance Mr Young determines to be motion, (see MOTION, N° 16.); and he proceeds to inquire by what kind of motion it produces matter, or inert and resisting atoms.

"Whatever portion of the ACTIVE SUBSTANCE is given to form an atom, the following things are necessary to be united in such portion of active substance: 1*st*, It must in some respect continually move; for otherwise it would lose its nature, and cease to be active. 2*dly*, It must also in some other respect be at rest, for otherwise it could not form an inactive atom. 3*dly*, It must preserve unity within itself." The author's proof

* If so, double or triple the mass, and a very strange phenomenon will be the result; for we shall have an active whole compounded of two or three inactive parts, even though those parts should not be in contact!

Plastic. proof of the first of these positions we have given elsewhere. The second he holds to be self-evident; and the third he thinks established by the following reasoning: "Solidity is the result of those actions among the parts of any whole, whereby the unity of the whole is preserved within itself. Several uncohering things may be united by an external bond: this does not constitute these one solid; it may be one bundle: but if several things cohere, and have an unity preserved within themselves, they become one solid. An atom is the least and most simple solid."

Having thus proved the necessity of these three requisites to the formation of an atom, he observes, that "the two first can only be united in a rotation of the portion of active substance about a centre or axis at rest. By such a motion, *all the parts* successively occupy *different places* in the orbit of rotation, and therefore move; the centre round which they revolve being at rest, the *whole portion* is also at rest; and thus the portion is at once moving and quiescent, as is required. The same kind of motion will also fulfil the terms of the third requisite; for a substance having a revolving motion around its own centre, preserves its unity by reason of all the parts preserving the same relation to the centre: and further, a motion of the active substance about a centre or axis will be an activity in the same orbit, which will act upon and resist whatever shall interfere to oppose its activity, or destroy the unity of the sphere, by diverting the course of the revolving motions. The activity or motion of a portion of ACTIVE SUBSTANCE about a centre will, therefore, give solidity to such portion; for it will give it unity and resistance, and in a manner tie together all the parts, forming them into one mass about their common centre: for they move or are active not *towards* the centre, in which case they would be lost in non-extension; nor *from* the centre, where they would dissipate in boundless space; but *about* the centre, preserving the same limits of extension: and being in this way active, they in this way resist any other activity opposed to them, that is, they resist any action which tends to penetrate or divide this sphere of revolving activity. Therefore, since any portion of active substance does, by revolving about a centre, become an united, resisting, and quiescent whole, the smallest portions of the ACTIVE SUBSTANCE which have such motions will become *atoms*, or make the smallest portions of matter."

Having thus shown to his own satisfaction how atoms of matter are formed, he next explains what at first he confesses may have appeared a paradox, "how the ACTIVE SUBSTANCE, retaining its own nature and essential properties, continuing immaterial, unsolid, and active, puts on at the same time the form of matter, and becomes material, solid, and inert. A sphere of revolving active substance, as it revolves continually about a centre, and as parts of the substance, are considered as successively passing through every point in the orbit; considered thus in its parts, and in its motions, it is ACTIVE SUBSTANCE, immaterial, and unsolid; but the whole sphere, considered unitically, collectively, and as quiescent, is in this point of view a solid atom, material, and inert."

Such is the active substance of Mr Young, and such his theory of the formation of matter. That he has not with servility copied from the ancients, every reader of his book, who is not an absolute stranger to Greek and Roman literature, will readily acknowledge; and yet if his theory be well founded, he has discovered a middle substance between mind and matter, more properly *plastic* than Aristotle or Plato, Cudworth or Berkeley, ever conceived. But truth compels us to add, that to us his theory appears to labour under insuperable objections. That there *may* be in the universe a substance essentially active, and at the same time not intelligent, is a proposition which we are by no means inclined to controvert. Various phenomena, both in vegetable and animal life, lead us to suspect that there is such a substance; but it does not follow that we are inclined to adopt our author's doctrine respecting the formation of matter. He conceives his proof, indeed, to be "in its nature not at all imperfect, or to fall short of demonstration; and if any one refuse it, he thinks it will be necessary for him to show, either that the explanation offered is not sufficient, or that some other explanation will serve equally well." Plastic.

To show that the explanation offered is not sufficient, will not, we apprehend, be a very arduous task; but we have no inclination to attempt ourselves another explanation, because we believe that of the formation of matter no other account can be given than that which resolves it into the *fiat* of the Creator. That it cannot be formed by the motion of an immaterial substance in the manner which our author has very clearly described, seems to be a truth so evident as not to admit of proof; for if motion be, as he defines it, a change of place, every thing that is moved must have the quality of extension. But all the parts of this active substance which are given to form an atom, move round a centre, and are expressly said to occupy successively different *places* in the orbit of rotation. Every one of these parts, therefore, is an extended being: and since, according to our author, solidity is nothing but an *active power of resistance*, and the parts of this active substance, in their rotation round their centre, *act upon* and *resist* whatever interferes to oppose their activity, it follows that each of these parts is likewise a *solid being*. But, in the opinion of Mr Young himself, and of all mankind, whatever is extended and solid is material. This theory, therefore, exhibits a process in which atoms are formed of a substance, which, though it is said to be *active, immaterial*, and unsolid, appears, when narrowly inspected, to be nothing else than a collection of those very atoms of which the author pretends to explain the formation. Mr Young, who examines and very freely censures some of the doctrines of Newton and others, is too much a man of science to be offended at us for stating objections to a theory which is quite new, to a transformation which he himself acknowledges may to many "appear not only problematical and difficult to conceive, but wholly impossible, and implying contradictions absolutely and for ever irreconcileable." Whether this be a just character of it our readers must determine; but if we did not believe the author to be a man of ingenuity, we should not have introduced him or his work to their acquaintance.

PLASTIC Art, the art of representing all sorts of figures by the means of moulds. This term is derived from the Greek word πλαστικη, which signifies the "art of forming, modelling, or casting, in a mould." A mould in general is a body that is made hollow for that purpose. The artist makes use of it to form figures in bronze,

Plastic. bronze, lead, gold, silver, or any other metal or fusible substance. The mould is made of clay, stucco, or other composition, and is hollowed into the form of the figure that is to be produced; they then apply the jet, which is a sort of funnel, through which the metal is poured that is to form the figures, and that is called *running the metal into the mould.*

It is in this manner, but with much practice and attention, that the artist forms, 1. Equestrian and pedestrian statues of every kind; 2. Groups; 3. Pedestals; 4. Bass-reliefs; 5. Medallions; 6. Cannons, mortars, and other pieces of artillery; 7. Ornaments of architecture, as capitals, bases, &c.; 8. Various sorts of furniture, as lustres, branches, &c. in every kind of metal: and in the same manner figures are cast in stucco, plaster, or any other fusible matter. See *PLASTER of Paris.*

Wax being a substance that is very easily put in fusion, plastics make much use of it. There are impressions which are highly pleasing in coloured wax, of medallions, basso and alto relievos, and of detached figures; which, however, are somewhat brittle. But this matter has been carried too far: they have not only formed moulds to represent the likeness and the bust of a living person, by applying the plaster to the face itself, and afterwards casting melted wax into the mould; but they have also painted that waxen bust with the natural colours of the face, and have then applied glass eyes and natural hair; to which they have joined a stuffed body and limbs, with hands of wax; and have, lastly, dressed their figure in a real habit; and by these means have produced an object the most shocking and detestable that it is possible to conceive. It is not a statue, a bust, a natural resemblance that they form; but a dead body, a lifeless countenance, a mere carcase. The stiff air, the inflexible muscles, the haggard eyes of glass, all contribute to produce an object that is hideous and disgustful to every man of taste. Figures like these offend by affording too exact an imitation of nature. In no one of the polite arts ought imitation ever to approach so near the truth as to be taken for nature herself. Illusion must have its bounds; without which it becomes ridiculous.

There is another invention far more ingenious and pleasing, which is that wherein M. Lippart, antiquary and artist at Dresden, has so much excelled. He has found the means of resembling, by indefatigable labour, great expence, and infinite taste, that immense number of stones, engraved and in camaieu, which are to be seen in the most celebrated cabinets. He has made choice of those that are the most beautiful; and, with a paste of his own invention, he takes from these stones an impression that is surprisingly accurate, and which afterwards become as marble: these impressions he calls *pasti.* He then gives them a proper colour, and incloses each with a gold rim; and by ranging them in a judicious order, forms of them an admirable system. They are fixed on pasteboards, which form so many drawers, and are then enclosed in cases, which represent folio volumes, and have titles wrote on their backs; so that these fictitious books may conveniently occupy a place in a library. Nothing can be more ingenious than this invention; and, by means of it, persons of moderate fortune are enabled to make a complete collection of all antiquity has left that is excellent of this kind; and the copies are very little inferior to the originals.

There is also another method of taking the impressions of camaieus, medals, and coins, which is as follows: They wash or properly clean the piece whose impression is to be taken, and surround it with a border of wax. They then dissolve isinglass in water, and make a decoction of it, mixing with it some vermilion, to give it an agreeable red colour. They pour this paste, when hot, on the stone or medal, to the thickness of about the tenth part of an inch; they then leave it exposed to the sun, in a place free from dust. After a few days this paste becomes hard, and offers to the eye the most admirable and faithful representation of the medal that it is possible to conceive: they are then carefully placed in drawers; and thousands of these impressions, which comprehend many ages, may be included in a small compass.

The proficients in plastics have likewise invented the art of casting in a mould papier maché or dissolved paper, and forming it into figures in imitation of sculpture, of ornaments and decorations for ceilings, furniture, &c. and which they afterwards paint or gild. There are, however, some inconveniences attending this art; as, for example, the imperfections in the moulds, which render the contours of the figures inelegant, and give them a heavy air: these ornaments, moreover, are not so durable as those of bronze or wood, seeing that in a few years they are preyed on by the worm.

The figures that are given to porcelain, Delft ware, &c. belong also to plastics; for they are formed by moulds, as well as by the art of the sculptor, and turner; and by all these arts united are made vases of every kind, figures, groups, and other designs, either for use or ornament.

From this general article the reader is referred to FOUNDERY, CAST, GLAZING, PORCELAIN, *PAPIER-Maché*, POTTERY, *DELFT Ware.*

Plastic, Plata. PLATA, the name of a very great river of South America, running through the province of Paraguay: whence the whole country is sometimes called *Plata;* though this name is usually bestowed only upon a part of Paraguay. In the latter sense it comprehends all that country bounded on the east and south-east by the Atlantic ocean; on the south by Terra Magellanica; on the west, by Tucuman; and on the north, by the provinces of Paraguay Proper and Parana. The great river La Plata, from which the country has its name, was first discovered, in 1515, by Juan Diaz de Solis; but denominated *La Plata* by Sebastian Gabato, from the great quantity of the precious metals he procured from the adjacent inhabitants, imagining it was the produce of the country, though in fact they brought it from Peru.

The country lies between 32° and 37° of south latitude. The climate is pleasant and healthy. Their winter is in May, June, and July, when the nights are indeed very cold, but the days moderately warm; the frost is neither violent nor lasting, and the snows are very inconsiderable.

The country consists mostly of plains of a vast extent, and exceeding rich soil, producing all sorts of European and American fruits, wheat, maize, cotton, sugar, honey, &c. and abounding with such excellent pastures, that the beasts brought hither from Spain are multiplied to such a degree, that they are all in common, no man claiming any property in them, but every

Plata, Platææ.

man takes what he hath occasion for. The number of black cattle, especially, is so prodigious, that many thousands of them are killed merely for their hides, every time the ships go for Spain, and their carcases left to be devoured by wild beasts and birds of prey, which are also very numerous. Sometimes, when they cannot vend their hides, they will kill them for their tongues; and those who care not to be at the trouble to fetch them from the plains, may buy them for a trifle. There is a curious account in Lord Anson's voyage of the manner of hunting them on horseback; and of catching and killing them, by throwing a noose on their horns at full gallop, the horses being trained to the sport. Horses are no less numerous, and in common like the other cattle: so that a man may have as many as he pleases for the catching; and of those that are already broke, one may buy some of the best, and of the true Spanish breed, for a piece-of-eight per head. Wild-fowl also is in great plenty here; partridges in particular are more numerous, and as large and tame as our hens, so that one may kill them with a stick. Their wheat makes the finest and whitest of bread; and, in a word, they seem to want for nothing here, especially the natives, but salt and fuel. The former the Spaniards have brought to them from other parts; and the latter they supply themselves with, by planting vast numbers of almond, peach, and other trees, which require no other trouble than putting the kernels into the ground, and by the next year, we are told, they begin to bear fruit. The return for European commodities is so great here, that it almost exceeds belief; an ordinary two-penny knife fetching a crown, and a gun of the value of 10 or 12 shillings 20 or 30 crowns, and so of the rest.

The river Plata rises in Peru, and receives a great many others in its course; the chief of which is the Paraguay. The water of it is said to be very clear and sweet, and to petrify wood; and contains such plenty and variety of fish, that the people catch great quantities of them without any other instrument than their hands. It runs mostly to the south and south-east; and is navigable the greater part of its course by the largest vessels, and full of delightful islands. All along its banks are seen the most beautiful birds of all kinds; but it sometimes overflows the adjacent country to a great extent, and is infested by serpents of a prodigious bigness. From its junction with the Paraguay to its mouth it is above 200 leagues. We may form some judgment of its largeness by the width of its mouth, which is said to be about 70 leagues. Before it falls into the Paraguay it is called *Panama*. See PANAMA.

PLATÆÆ, in *Ancient Geography*, a very strong town of Bœotia, in its situation exposed to the north wind (Theophrastus); burnt to the ground by Xerxes (Herodotus, Justinus); mentioned much in the course of the Persian war: Famous for the defeat of Mardonius, the Persian general; and for the most signal victory of the Lacedæmonians and other Greeks under Pausanias the Lacedæmonian, and Aristides an Athenian general (Nepos, Diodorus, Plutarch); in memory of which the Greeks erected a temple to Jupiter Eleutherius, and instituted games which they called *Eleutheria;* and there they show the tombs of those who fell in that battle (Strabo). It stood at the foot of Mount Cithæron, between that and Thebes to the north, on the road to Athens and Megara, and on the confines of Attica and Megaris. Now in ruins.

Platææ ‖ Plate.

PLATALEA, the SPOONBILL, a genus of birds belonging to the order of grallæ. See ORNITHOLOGY *Index*.

PLATANUS, the PLANE-TREE; a genus of plants belonging to the monœcia class. See BOTANY *Index*.

PLATBAND, in *Gardening*, a border or bed of flowers, along a wall, or the side of a parterre, frequently edged with box, &c.

PLATBAND of a door or window, is used for the lintel, where that is made square, or not much marked.

PLATE, a term which denotes a piece of wrought silver, such as the shallow vessel off which meat is eaten. It is likewise used by sportsmen to express the reward given to the best horse at our races.

The winning a plate is not the work of a few days to the owner of the horse; but great care and preparation is to be made for it, if there is any great dependence on the success. A month is the least time that can be allowed to draw the horse's body clear, and to refine his wind to that degree of perfection that is attainable by art. *Sportsman's Dictionary.*

It is first necessary to take an exact view of his body, whether he be low or high in flesh; and it is also necessary to consider whether he be dull and heavy, or brisk and lively when abroad. If he appear dull and heavy, and there is reason to suppose it is owing to too hard riding, or, as the jockeys express it, to some grease that has been dissolved in hunting, and has not been removed by scouring, then the proper remedy is half an ounce of diapente given in a pint of good sack; this will at once remove the cause, and revive the creature's spirits. After this, for the first week of the month, he is to be fed with oats, bread, and split beans; giving him sometimes the one and sometimes the other as he likes best; and always leaving some in the locker, that he may feed at leisure when he is left alone. When the groom returns at the feeding time, whatever is left of this must be removed, and fresh given; by this means the creature will soon become high-spirited, wanton, and full of play. Every day he must be rode out an airing, and every other day it will be proper to give him a little more exercise; but not so much as to make him sweat too much. The beans and oats in this case are to be put into a bag, and beaten till the hulls are all off, and then winnowed clean; and the bread, instead of being chipped in the common way, is to have the crust clean cut off. If the horse be in good flesh and spirits when taken up for its month's preparation, the diapente must be omitted; and the chief business will be to give him good food, and so much exercise as will keep him in wind, without oversweating him or tiring his spirits. When he takes larger exercises afterwards, towards the end of the month, it will be proper to have some horses in the place to run against him. This will put him upon his mettle, and the beating them will give him spirits. This, however, is to be cautiously observed, that he has not a bloody heat given him for ten days or a fortnight before the plate is to be run for; and that the last heat that is given him the day before the race, must be in his clothes: this will make him run with greatly more vigour, when stripped for the race, and feeling the cold wind on every part.

In the second week, the horse should have the same food,

food, and more exercife. In the laft fortnight, he muft have dried oats, that have been hulled by beating. After this they are to be wetted in a quantity of whites of eggs beaten up, and then laid out in the fun to dry; and when as dry as before, the horfe is to have them. This fort of food is very light of digeftion, and very good for the creature's wind. The beans in this time fhould be given more fparingly, and the bread fhould be made of three parts wheat and one part beans. If he fhould become coftive under this courfe, he muft then have fome ale and whites of eggs beaten together; this will cool him, and keep his body moift.

In the laft week the mafh is to be omitted, and barley-water given him in its place, every day, till the day before the race: he fhould have his fill of hay; then he muft have it given him more fparingly, that he may have time to digeft it; and in the morning of the race day he muft have a toaft or two of white bread foaked in fack, and the fame juft before he is let out to the field. This is an excellent method, becaufe the two extremes of fullnefs and fafting are at this time to be equally avoided: the one hurting his wind, and the other occafioning faintnefs that may make him lofe. After he has had his food, the litter is to be fhook up, and the ftable kept quiet, that he may be difturbed by nothing till he is taken out to run.

PLATFORM, in the military art, an elevation of earth, on which cannon is placed to fire on the enemy; fuch are the mounts in the middle of curtains. On the ramparts there is always a platform, where the cannon are mounted. It is made by the heaping up of earth on the rampart, or by an arrangement of madriers, rifing infenfibly, for the cannon to roll on, either in a cafemate or on attack in the outworks. All practitioners are agreed, that no fhot can be depended on, unlefs the piece can be placed on a folid platform; for if the platform fhakes with the firft impulfe of the powder, the piece muft likewife fhake, which will alter its direction, and render the fhot uncertain.

PLATFORM, in *Architecture*, is a row of beams which fupport the timber-work of a roof, and lie on the top of a wall where the entablature ought to be raifed.

This term is alfo ufed for a kind of terrace or broad fmooth open walk at the top of a building, from whence a fair profpect may be taken of the adjacent country. Hence an edifice is faid to be covered with a platform, when it is flat at top, and has no ridge. Moft of the oriental buildings are thus covered, as were all thofe of the ancients.

PLATFORM, or *Orlop*, in a man of war, a place on the lower deck, abaft the main-maft, between it and the cockpit, and round about the main capftan, where provifion is made for the wounded men in time of action.

PLATINA is a metallic fubftance, the name of which has an allufion to its colour. It is a diminutive of *plata*, and fignifies "little filver." From its great fpecific gravity, and other refemblances which it has to gold, it has been called *or blanc*, or *white gold*; from its refractory nature, *diabolus metallorum*; from fome doubts entertained of its character as a metal, *juan blanco*, *white jack*, *white rogue*, or *white mock metal*. It has alfo received the appellation of the *eighth metal*: and, probably from fome diftrict which affords it, has gotten the name of *platina del Pinto*. For an account of its properties, and for its natural hiftory, fee CHEMISTRY; MINERALOGY; and ORES, *Reduction of*.

PLATING is the art of covering bafer metals with a thin plate of filver either for ufe or for ornament. It is faid to have been invented by a fpur-maker, not for fhow but for real utility. Till then the more elegant fpurs in common ufe were made of folid filver, and from the flexibility of that metal they were liable to be bent into inconvenient forms by the flighteft accident. To remedy this defect, a workman at Birmingham contrived to make the branches of a pair of fpurs hollow, and to fill that hollow with a flender rod of fteel or iron. Finding this a great improvement, and being defirous to add cheapnefs to utility, he continued to make the hollow larger, and of courfe the iron thicker and thicker, till at laft he difcovered the means of coating an iron fpur with filver in fuch a manner as to make it equally elegant with thofe which were made wholly of that metal. The invention was quickly applied to other purpofes; and to numberlefs utenfils which were formerly made of brafs or iron are now given the ftrength of thefe metals, and the elegance of filver, for a fmall additional expence.

The filver plate is generally made to adhere to the bafer metal by means of folder; which is of two kinds, the *foft* and the *hard*, or the *tin* and *filver* folders. The former of thefe confifts of tin alone, the latter generally of three parts of filver and one of brafs. When a buckle, for inftance, is to be plated by means of the foft folder, the ring, before it is bent, is firft tinned, and then the filver-plate is gently hammered upon it, the hammer employed being always covered with a piece of cloth. The filver now forms, as it were, a mould to the ring, and whatever of it is not intended to be ufed is cut off. This mould is faftened to the ring of the buckle by two or three cramps of fmall iron-wire; after which the buckle, with the plated fide undermoft, is laid upon a plate of iron fufficiently hot to melt the tin, but not the filver. The buckle is then covered with powdered refin or anointed with turpentine; and left there fhould be a deficiency of tin, a fmall portion of rolled tin is likewife melted on it. The buckle is now taken off with a tongs, and commonly laid on a bed of fand, where the plate and the ring, while the folder is yet in a ftate of fufion, are more clofely compreffed by a fmart ftroke with a block of wood. The buckle is afterwards bent and finifhed.

Sometimes the melted tin is poured into the filver mould, which has been previoufly rubbed over with fome flux. The buckle ring is then put among the melted tin, and the plating finifhed. This is called by the workmen *filling up*.

When the hard folder is employed, the procefs is in many refpects different. Before the plate is fitted to the iron or other metal, it is rubbed over with a folution of borax. Stripes of filver are placed along the joinings of the plate; and inftead of two or three cramps, as in the former cafe, the whole is wrapped round with fmall wire; the folder and joinings are again rubbed with the borax, and the whole put into a charcoal fire till the folder be in fufion. When taken out, the wire is inftantly removed, the plate is cleaned by the application of fome acid, and afterwards made fmooth by the ftrokes of a hammer.

Metal

Plating, Plato.

Metal plating is when a bar of ſilver and copper are taken of at leaſt one equal ſide. The equal ſides are made ſmooth, and the two bars faſtened together by wire wrapped round them. Theſe bars are then ſweated in a charcoal fire, and after ſweating, they adhere as cloſely together as if they were ſoldered. After this they are flattened into a plate between two rollers, when the copper appears on one ſide and the ſilver on the other. This ſort of plate is named *plated metal*.

French plating is when ſilver-leaf is burniſhed on a piece of metal in a certain degree of heat.

When ſilver is diſſolved in aquafortis, and precipitated upon another metal, the proceſs is called *ſilvering*. See SOLDERING.

PLATO, an illuſtrious philoſopher of antiquity, was by deſcent an Athenian, though the place of his birth was the iſland of Egina. His lineage through his father is traced back to Codrus the laſt king of Athens, and through his mother to Solon the celebrated legiſlator. The time of his birth is commonly placed in the beginning of the 88th Olympiad; but Dr Enfield thinks it may be more accurately fixed in the third year of the 87th Olympiad, or 430 years before the Chriſtian era. He gave early indications of an extenſive and original genius, and had an education ſuitable to his high rank, being inſtructed in the rudiments of letters by the grammarian Dionyſius, and trained in athletic exerciſes by Ariſto of Argos. He applied with great diligence to the ſtudy of the arts of painting and poetry; and made ſuch proficiency in the latter, as to produce an epic poem, which, upon comparing it with the poems of Homer, he committed to the flames. At the age of 20 he compoſed a dramatic piece; but after he had given it to the performers, happening to attend upon a diſcourſe of Socrates, he was ſo captivated by his eloquence, that he reclaimed his tragedy, without ſuffering it to be acted, renounced the muſes, burnt all his poems, and applied himſelf wholly to the ſtudy of wiſdom.

It is thought that Plato's firſt maſters in philoſophy were Cratylus and Hermogenes, who taught the ſyſtems of Heraclitus and Parmenides; but when he was 20 years old, he attached himſelf wholly to Socrates, with whom he remained eight years in the relation of a ſcholar. During this period, he frequently diſpleaſed his companions, and ſometimes even his maſter, by grafting upon the Socratic ſyſtem opinions which were taken from ſome other ſtock. It was the practice of the ſcholars of Socrates to commit to writing the ſubſtance of their maſter's diſcourſes. Plato wrote them in the form of dialogues; but with ſo great additions of his own, that Socrates, hearing him recite his Lyſis, cried out, "O Hercules! how many things does this young man feign of me!"

Plato, however, retained the warmeſt attachment to his maſter. When that great and good man was ſummoned before the ſenate, his illuſtrious ſcholar undertook to plead his cauſe, and began a ſpeech in his defence; but the partiality and violence of the judges would not permit him to proceed. After the condemnation, he preſented his maſter with money ſufficient to redeem his life; which, however, Socrates refuſed to accept. During his impriſonment, Plato attended him, and was preſent at a converſation which he held with his friends concerning the immortality of the ſoul; the ſubſtance of which he afterwards committed to writing in the beautiful dialogue intitled *Phædo*, not, however, without interweaving his own opinions and language.

Plato.

The philoſophers who were at Athens were ſo alarmed at the death of Socrates, that moſt of them fled from the city to avoid the injuſtice and cruelty of the government. Plato, whoſe grief upon this occaſion is ſaid by Plutarch to have been exceſſive, retired to Megara, where he was kindly entertained by Euclid, who had been one of Socrates's firſt ſcholars, till the ſtorm was over. Afterwards he determined to travel in purſuit of knowledge; and from Megara he went to Italy, where he conferred with Eurytus, Philolaus, and Archytas. Theſe were the moſt celebrated of the followers of Pythagoras, whoſe doctrine was then become famous in Greece; and from theſe the Pythagoreans have affirmed that he had all his natural philoſophy. He dived into the moſt profound and myſterious ſecrets of the Pythagoric doctrines; and perceiving other knowledge to be connected with them, he went to Cyrene, where he learned geometry of Theodorus the mathematician. From thence he paſſed into Egypt, to acquaint himſelf with the theology of their prieſts, to ſtudy more nicely the proportions of geometry, and to inſtruct himſelf in aſtronomical obſervations; and having taken a full ſurvey of all the country, he ſettled for ſome time in the province of Sais, learning of the wiſe men there, what they held concerning the univerſe, whether it had a beginning, whether it moved wholly or in part, &c.; and Pauſanias affirms, that he learned from theſe the immortality, and alſo the tranſmigration, of ſouls. Some of the fathers will have it, that he had communication with the books of Moſes, and that he ſtudied under a learned Jew of Heliopolis; but there is nothing that can be called evidence for theſe aſſertions. St Auſtin once believed that Plato had ſome conference with Jeremiah; but afterwards diſcovered, that that prophet muſt have been dead at leaſt 60 years before Plato's voyage to Egypt.

Plato's curioſity was not yet ſatisfied. He travelled into Perſia to conſult the magi about the religion of that country: and he deſigned to have penetrated even to the Indies, and to have learned of the Brachmans their manners and cuſtoms; but the wars in Aſia prevented him.

"He then returned into Italy, to the Pythagorean ſchool at Tarentum, where he endeavoured to improve his own ſyſtem, by incorporating with it the doctrine of Pythagoras, as it was then taught by Archytas, Timæus, and others. And afterwards, when he viſited Sicily, he retained ſuch an attachment to the Italic ſchool, that, through the bounty of Dionyſius, he purchaſed at a vaſt price ſeveral books which contained the doctrine of Pythagoras, from Philolaus, one of his followers.

"Returning home richly ſtored with knowledge of various kinds, Plato ſettled in Athens, and executed the deſign, which he had doubtleſs long had in contemplation, of forming a new ſchool for the inſtruction of youth in the principles of philoſophy. The place which he made choice of for this purpoſe was a public grove, called the *Academy*, from Hecademus, who left it to the citizens for the purpoſe of gymnaſtic exerciſes. Adorned with ſtatues, temples, and ſepulchres, planted with lofty plane-trees, and interſected by a gentle ſtream, it afforded a delightful retreat for philoſophy and the muſes. Of this retreat Horace ſpeaks:

Atque

Atque inter ſylvas Academi quærere verum.

"'Midſt Academic groves to ſearch for truth."

Within this incloſure he poſſeſſed, as a part of his humble patrimony, purchaſed at the price of three thouſand drachmas, a ſmall garden, in which he opened a ſchool for the reception of thoſe who might be inclined to attend his inſtructions. How much Plato valued mathematical ſtudies, and how neceſſary a preparation he thought them for higher ſpeculations, appears from the inſcription which he placed over the door of his ſchool: Ουδεὶς ἀγεωμέτρητος εἰσίτω. "Let no one who is unacquainted with geometry enter here."

"This new ſchool ſoon became famous, and its maſter was ranked among the moſt eminent philoſophers. His travels into diſtant countries, where learning and wiſdom flouriſhed, gave him celebrity among his brethren of the Socratic ſect. None of theſe had ventured to inſtitute a ſchool in Athens except Ariſtippus; and he had confined his inſtructions almoſt entirely to ethical ſubjects, and had brought himſelf into ſome diſcredit by the freedom of his manners. Plato alone remained to inherit the patrimony of public eſteem which Socrates had left his diſciples; and he poſſeſſed talents and learning adequate to his deſign of extending the ſtudy of philoſophy beyond the limits within which it had been incloſed by his maſter. The conſequence was, not only that young men crowded to his ſchool from every quarter, but that people of the firſt diſtinction in every department frequented the academy. Even females, diſguiſed in men's clothes, often attended his lectures. Among the illuſtrious names which appear in the catalogue of his followers are Dion the Syracuſan prince, and the orators Hyperides, Lycurgus, Demoſthenes, and Iſocrates.

"Greatneſs was never yet exempted from envy. The diſtinguiſhed reputation of Plato brought upon him the hatred of his former companions in the ſchool of Socrates, and they loaded him with detraction and obloquy. It can only be aſcribed to mutual jealouſy, that Xenophon and he, though they relate the diſcourſes of their common maſter, ſtudiouſly avoid mentioning one another. Diogenes the Cynic ridiculed Plato's doctrine of ideas and other abſtract ſpeculations. In the midſt of theſe private cenſures, however, the public fame of Plato daily increaſed; and ſeveral ſtates, among which were the Arcadians and Thebans, ſent ambaſſadors with earneſt requeſts that he would come over, not only to inſtruct the young men in philoſophy, but alſo to preſcribe them laws of government. The Cyrenians, Syracuſans, Cretans, and Eleans, ſent alſo to him: he did not go to any of them, but gave laws and rules of governing to all. He lived ſingle, yet ſoberly and chaſtely. He was a man of great virtues, and exceedingly affable; of which we need no greater proof, than his civil manner of converſing with the philoſophers of his own times, when pride and envy were at their height. His behaviour to Diogenes is always mentioned in his hiſtory. The Cynic was vaſtly offended, it ſeems, at the politeneſs and fine taſte of Plato, and uſed to catch all opportunities of ſnarling at him. He dined one day at his table with other company, and trampling upon the tapeſtry with his dirty feet, uttered this brutiſh ſarcaſm, "I trample upon the pride of Plato;" to which Plato wiſely reparteed, "With greater pride."

The fame of Plato drew diſciples to him from all parts; among whom were Speuſippus an Athenian, his ſiſter's ſon, whom he appointed his ſucceſſor in the academy, and the great Ariſtotle.

The admiration of this illuſtrious man was not confined to the breaſts of a few philoſophers. He was in high eſteem with ſeveral princes, particularly Archelaus king of Macedon, and Dionyſius tyrant of Sicily. At three different periods he viſited the court of this latter prince, and made ſeveral bold but unſucceſsful attempts to ſubdue his haughty and tyrannical ſpirit. A brief relation of the particulars of theſe viſits to Sicily may ſerve to caſt ſome light upon the character of our philoſopher; and we ſhall give it in the words of Dr Enfield, from whoſe elegant hiſtory of philoſophy we have extracted by much the moſt valuable parts of this article.

"The profeſſed object of Plato's firſt viſit to Sicily, which happened in the 40th year of his age, during the reign of the elder Dionyſius the ſon of Hermocrates, was, to take a ſurvey of the iſland, and particularly to obſerve the wonders of Mount Ætna. Whilſt he was reſident at Syracuſe, he was employed in the inſtruction of Dion, the king's brother-in-law, who poſſeſſed excellent abilities, though hitherto reſtrained by the terrors of a tyrannical government, and relaxed by the luxuries of a licentious court. Diſguſted by the debauched manners of the Syracuſans, he endeavoured to reſcue his pupil from the general depravity. Nor did Dion diſappoint his preceptor's expectations. No ſooner had he received a taſte of that philoſophy which leads to virtue, than he was fired with an ardent love of wiſdom. Entertaining an hope that philoſophy might produce the ſame effect upon Dionyſius, he took great pains to procure an interview between Plato and the tyrant. In the courſe of the conference, whilſt Plato was diſcourſing on the ſecurity and happineſs of virtue, and the miſeries attending injuſtice and oppreſſion, Dionyſius, perceiving that the philoſopher's diſcourſe was levelled againſt the vices and cruelties of his reign, diſmiſſed him with high diſpleaſure from his preſence, and conceived a deſign againſt his life. It was not without great difficulty that Plato, by the aſſiſtance of Dion, made his eſcape. A veſſel which had brought over Pollis, a delegate from Sparta, was fortunately at that time returning to Greece. Dion engaged Pollis to take the charge of the philoſopher, and land him ſafely in his native country; but Dionyſius diſcovered the deſign, and obtained a promiſe from Pollis, that he would either put him to death or ſell him as a ſlave upon the paſſage. Pollis accordingly ſold him in the iſland of Ægina; the inhabitants of which were then at war with the Athenians. Plato could not long remain unnoticed: Anicerris, a Cyrenaic philoſopher, who happened to be at that time in the iſland, diſcovered the ſtranger, and thought himſelf happy in an opportunity of ſhowing his reſpect for ſo illuſtrious a philoſopher; he purchaſed his freedom for 30 minæ, or 84l. 10s. ſterling money, and ſent him home to Athens. Repayment being afterwards offered to Anicerris by Plato's relations, he refuſed the money, ſaying, with that generous ſpirit which true philoſophy always inſpires, that he ſaw no reaſon why the relations of Plato ſhould engroſs to themſelves the honour of ſerving him."

After a ſhort interval, Dionyſius repented of his ill-placed

Plato.

placed resentment, and wrote to Plato, earnestly requesting him to repair his credit by returning to Syracuse; to which Plato gave this high-spirited answer, that philosophy would not allow him leisure to think of Dionysius. He was, however, prevailed upon by his friend Dion to accept of the tyrant's invitation to return to Syracuse, and take upon him the education of Dionysius the younger, who was heir apparent to the monarchy. He was received by Dionysius the reigning sovereign with every possible appearance of respect; but after seeing his friend banished, and being himself kept as a prisoner at large in the palace, he was by the tyrant sent back into his own country, with a promise that both he and Dion should be recalled at the end of the war in which the Sicilians were then engaged. This promise was not fulfilled. The tyrant wished for the return of Plato, but could not resolve to recal Dion. At last, however, having probably promised that the philosopher should meet his friend at the court of Syracuse, he prevailed upon Plato to visit that capital a third time. When he arrived, the king met him in a magnificent chariot, and conducted him to his palace. The Sicilians too rejoiced in his return; for they hoped that the wisdom of Plato would at length triumph over the tyrannical spirit of the prince. Dionysius seemed wholly divested of his former resentments, listened with apparent pleasure to the philosopher's doctrine, and, among other expressions of regard, presented him with eighty talents of gold. In the midst of a numerous train of philosophers, Plato now possessed the chief influence and authority in the court of Syracuse. Whilst Aristippus was enjoying himself in splendid luxury; whilst Diogenes was freely indulging his acrimonious humour; and whilst Æschines was gratifying his thirst after riches;—Plato supported the credit of philosophy with an air of dignity, which his friends regarded as an indication of superior wisdom, but which his enemies imputed to pride. After all, it was not in the power of Plato to prevail upon Dionysius to adopt his system of policy, or to recal Dion from his exile. Mutual distrust, after a short interval, arose between the tyrant and the philosopher; each suspected the other of evil designs, and each endeavoured to conceal his suspicion under the disguise of respect. Dionysius attempted to impose upon Plato by condescending attentions, and Plato to deceive Dionysius by an appearance of confidence. At length, the philosopher became so much dissatisfied with his situation, that he earnestly requested permission to return to Greece, which was at last granted him, and he was sent home loaded with rich presents. On his way to Athens, passing through Elis during the celebration of the Olympic games, he was present at this general assembly of the Greeks, and engaged universal attention.

From this narrative it appears, that if Plato visited the courts of princes, it was chiefly from the hope of seeing his ideal plan of a republic realized; and that his talents and attainments rather qualified him to shine in the academy than in the council or the senate.

Plato, now restored to his country and his school, devoted himself to science, and spent the last years of a long life in the instruction of youth. Having enjoyed the advantage of an athletic constitution, and lived all his days temperately, he arrived at the 81st, or according to some writers the 79th, year of his age, and died, through the mere decay of nature, in the first year of the hundred and eighth Olympiad. He passed his whole life in a state of celibacy, and therefore left no natural heirs, but transferred his effects by will to his friend Adiamantus. The grove and garden, which had been the scene of his philosophical labours, at last afforded him a sepulchre. Statues and altars were erected to his memory; the day of his birth long continued to be celebrated as a festival by his followers; and his portrait is to this day preserved in gems: but the most lasting monuments of his genius are his writings, which have been transmitted, without material injury, to the present times.

Plato.

The character of this philosopher has always been high. Besides the advantages of a noble birth, he had a large and comprehensive understanding, a vast fund of wit and good taste, great evenness and sweetness of temper, all cultivated and refined by education and travel; so that it is no wonder if he was honoured by his countrymen, esteemed by strangers, and adored by his scholars. The ancients thought more highly of Plato than of all their philosophers: they always called him the *Divine Plato*; and they seemed resolved that his descent should be more than human. "There are (says Apuleius) who assert Plato to have sprung from a more sublime conception; and that his mother Perictione, who was a very beautiful woman, was impregnated by Apollo in the shape of a spectre." Plutarch, Suidas, and others, affirm this to have been the common report at Athens. When he was an infant, his father Aristo went to Hymettus, with his wife and child, to sacrifice to the muses; and while they were busied in the divine rites, a swarm of bees came and distilled their honey upon his lips. This, says Tully, was considered as a presage of his future eloquence. Apuleius relates, that Socrates, the night before Plato was recommended to him, dreamed that a young swan fled from Cupid's altar in the academy, and settled in his lap; thence soared to heaven, and delighted the gods with its music: and when Aristo the next day presented Plato to him, "Friends (says Socrates), this is the swan of Cupid's academy." The Greeks loved fables: they show however in the present case, what exceeding respect was paid to the memory of Plato. Tully perfectly adored him; tells us, how he was justly called by Panætius the *divine*, the *most wise*, the *most sacred*, the *Homer of Philosophers*; entitled him to Atticus, *Deus ille noster*; thinks, that if Jupiter had spoken Greek, he would have spoken in Plato's language, and made him so implicitly his guide in wisdom and philosophy, as to declare, that he had rather err with Plato than be right with any one else. But, panegyric aside, Plato was certainly a very wonderful man, of a large and comprehensive mind, an imagination infinitely fertile, and of a most flowing and copious eloquence. Nevertheless, the strength and heat of fancy prevailing in his composition over judgment, he was too apt to soar beyond the limits of earthly things, to range in the imaginary regions of general and abstracted ideas; and on which account, though there is always a greatness and sublimity in his manner, he did not philosophize so much according to truth and nature as Aristotle, though Cicero did not scruple to give him the preference.

The writings of Plato are all in the way of dialogue; where he seems to deliver nothing from himself, but every thing

Plato ‖ Platoniſm.

thing as the ſentiments and opinions of others, of Socrates chiefly, of Timæus, &c. He does not mention himſelf anywhere, except once in his Phædo, and another time in his Apology for Socrates. His ſtyle, as Ariſtotle obſerved, is betwixt proſe and verſe: on which account, ſome have not ſcrupled to rank him with the poets. There is a better reaſon for ſo doing than the elevation and grandeur of his ſtyle: his matter is oftentimes the offspring of imagination, inſtead of doctrines or truths deduced from nature. The firſt edition of Plato's works in Greek was put out by Aldus at Venice in 1513; but a Latin verſion of him by Marſilius Ficinus had been printed there in 1491. They were reprinted together at Lyons in 1588, and at Francfort in 1602. The famous printer Henry Stephens, in 1578, gave a moſt beautiful and correct edition of Plato's works at Paris, with a new Latin verſion by Serranus, in three volumes folio; and this deſervedly paſſes for the beſt edition of Plato: yet Serranus's edition is very exceptionable, and in many reſpects, if not in all, inferior to that of Ficinus.

PLATONIC, ſomething that relates to Plato, his ſchool-philoſophy, opinions, or the like. Thus, platonic love denotes a pure ſpiritual affection, for which Plato was a great advocate, ſubſiſting between the different ſexes, abſtracted from all carnal appetites, and regarding no other object but the mind and its beauties; or it is even a ſincere diſintereſted friendſhip ſubſiſting between perſons of the ſame ſex, abſtracted from any ſelfiſh views, and regarding no other object than the perſon, if any ſuch love or friendſhip has aught of a foundation in nature.

PLATONIC Year, or the *Great Year*, is a period of time determined by the revolution of the equinoxes, or the ſpace wherein the ſtars and conſtellations return to their former places in reſpect of the equinoxes. The platonic year, according to Tycho Brahe, is 25816, according to Ricciolus 25910, and according to Caſſini 24800 years.

This period once accompliſhed, it was an opinion among the ancients that the world was to begin anew, and the ſame ſeries of things to turn over again.

PLATONISM, the philoſophy of Plato, which was divided into three branches, *theology*, *phyſics*, and *mathematics*. Under *theology* were comprehended metaphyſics and ethics, or that which in modern language is called *moral* philoſophy. Plato wrote likewiſe on *dialectics*, but with ſuch inferiority to his pupil Ariſtotle, that his works in that department of ſcience are ſeldom mentioned.

The ancient philoſophers always began their theological ſyſtems with ſome diſquiſition on the nature of the gods, and the formation of the world; and it was a fundamental doctrine with them, that *from nothing nothing can proceed*. We are not to ſuppoſe that this general axiom implied nothing more than that for every effect there muſt be a cauſe; for this is a propoſition which no man will controvert who underſtands the terms in which it is expreſſed: but the ancients believed that a proper creation is impoſſible even to omnipotence, and that to the production of any thing a *material* is not leſs *neceſſary* than an *efficient* cauſe, (ſee METAPHYSICS, N° 264—304.). That with reſpect to this important queſtion, Plato agreed with his predeceſſors and contemporaries, appears evident to us from the whole tenor of his *Timæus*. We agree with Dr Enfield* in thinking, that in this dialogue, which comprehends his whole doctrine on the ſubject of the formation of the univerſe, matter is ſo manifeſtly ſpoken of as eternally co-exiſting with God, that this part of his doctrine could not have been miſtaken by ſo many learned and able writers, had they not been ſeduced by the deſire of eſtabliſhing a coincidence of doctrine between the writings of Plato and Moſes. It is certain that neither Cicero†, nor Apuleius‡, nor Alcinous§, nor even the later commentator Chalcidius, underſtood their maſter in any other ſenſe than as admitting two primary and incorruptible principles, God and matter; to which we ſhall afterwards ſee reaſon to add a third, namely ideas. The paſſages quoted by thoſe who maintain the contrary opinion are by no means ſufficient for their purpoſe. Plato, it is true, in his Timæus, calls God the *parent of the univerſe*, and in his Sophiſta ſpeaks of him as "forming animate and inanimate beings, which did not before exiſt:" but theſe expreſſions do not neceſſarily imply that this offſpring of Deity was produced from nothing, or that no prior matter exiſted from which theſe new beings were formed. Through the whole dialogue of the Timæus, Plato ſuppoſes two eternal and independent cauſes of all things; one, that by which all things are made, which is God; the other, that from which all things are made, which is matter. He diſtinguiſhes between God, matter, and the univerſe, and ſuppoſes the architect of the world to have formed it out of a maſs of pre-exiſtent matter. Matter, according to Plato, is an eternal and infinite principle. His doctrine on this head is thus explained by Cicero‖. "Matter, from which all things are produced and formed, is a ſubſtance without form or quality, but capable of receiving all forms, and undergoing every kind of change; in which, however, it never ſuffers annihilation, but merely a ſolution of its parts, which are in their nature infinitely diviſible, and move in portions of ſpace which are alſo infinitely diviſible. When that principle which we call quality is moved, and acts upon matter, it undergoes an entire change, and thoſe forms are produced, from which ariſes the diverſified and coherent ſyſtem of the univerſe." This doctrine Plato unfolds at large in his Timæus, and particularly inſiſts upon the notion, that matter has originally no form, but is capable of receiving any. He calls it the mother and receptacle of forms, by the union of which with matter the univerſe becomes perceptible to the ſenſes; and maintains, that the viſible world owes its forms to the energy of the divine intellectual nature.

Our author is ſupported in drawing this inference by the teſtimony of Diogenes Laertius, who ſurely underſtood the language and dogmas of Plato better than the moſt accompliſhed modern ſcholar can pretend to do; yet a learned writer* has lately expreſſed great ſurpriſe that any one ſhould conſider matter as having been, in Plato's opinion, uncreated; and he boldly affirms, that Laertius, inſtead of aſſerting that ſpirit and matter were the principles of all things, ought to have ſaid that God alone, in Plato's eſtimation, was their original.—To prove this, he gives from the Timæus a quotation, in which the founder of the academy declares that God *framed* heaven and earth, and the inferior deities; and that as he *faſhioned*, ſo he pervades all nature. He obſerves, that Cicero denominates the god of

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* Hiſt. of Philoſophy.

† Ac. Qu. lib. i. c. 6.

‡ Lib. i.

§ Cap. 10.

‖ Ac. Qu. lib. i. c. 8.

* Dr Ogilvie.

Platoniſm.

Plato the *maker*, and the god of Ariſtotle only the *governor*, of the world. And, to ſatisfy thoſe who may demand a particular proof of Plato's having taught a real creation, he affirms that his writings abound with declarations on the ſubject, of which the meaning cannot be miſapprehended. "With this purpoſe (ſays he) Plato denominates at one time the principles or ſubſtance of all things, Γεννηματα Θεου Δημιουργου, the productions of the efficient Deity, and at others enters more particularly into the queſtion. Thus, he obſerves, that many perſons are ignorant of the nature and power of mind or intellect, 'as having exiſted at the beginning, antecedent to all bodies.' Of this mind, he obſerves, that it is without exception Παντων πρεσβυτατη, *of all things the moſt ancient;* and he ſubjoins, in order to remove all doubt of his purpoſe, that it is alſo Αρχη κινησεως, *the cauſe or principle of motion.*"

Theology of Plato.

With all poſſible reſpect for Dr Ogilvie, of whoſe piety and erudition we are thoroughly convinced, we muſt take the liberty to ſay, that to us the declarations of Plato on this ſubject appear much leſs preciſe and explicit than they appear to him; and that the inference which he would draw from the *words* of Cicero ſeems not to flow neceſſarily from the *ſenſe* of thoſe words. That Plato believed God to have *framed* the heaven and the earth, and to have *faſhioned* all nature, is a poſition which as far as we know, has never been controverted; but between *framing* or *faſhioning* the chaos or ὑλη πρωτη, and calling the univerſe into exiſtence from non-entity, there is an infinite and an obvious difference. The diſtinction made by Cicero between the God of Plato and the God of Ariſtotle is a juſt diſtinction, but it will not bear the ſuperſtructure which the learned doctor builds upon it. Ariſtotle maintained the eternity of the world in its preſent form. Plato certainly taught that the firſt matter was in time reduced from a chaotic ſtate into *form* by the power of the Demiurgus; but we have ſeen nothing in his writings which explicitly declares his belief that the *firſt matter* was itſelf *created*.

The learned Cudworth, who wiſhed, like Dr Ogilvie, to find a coincidence of doctrine between the theology of Plato and that of the Goſpel, ſtrained all his faculties to prove that his favourite philoſopher taught a proper creation: but he laboured in vain. He gives a number of quotations in ſupport of his poſition; of which we ſhall here inſert only thoſe two upon which Dr Ogilvie ſeems to lay the greateſt ſtreſs. Plato, ſays the author of the Intellectual Syſtem, calls the one God (A) ὁς γην ουρανον και θεους, και παντα τα εν ουρανῳ και τα εν ᾁδου, και ὑπο γης ἁπαντα εργαζεται—*He that makes earth, and heaven, and the gods, and doth all things both in heaven, and hell, and under the earth.* And, again, "he by whoſe efficiency the things of the world (ὑστερον εγενετο, προτερον ουκ οντα) *were afterwards made when they were not before**." Both Cudworth and Ogilvie think this laſt ſentence an explicit declaration of Plato's belief in the creative power of God: but that they are miſtaken has been evinced by Moſheim with a force of argument which will admit of no reply. In that part of *the Sophiſt* from which the quotation is taken, Plato conſiders the δυναμιν ποιητικην, of which he is treating, as belonging both to God and to man; and he defines it in general to be "a certain power which is the cauſe that things may afterwards be which were not before." Cudworth wiſhes to confine this definition to the divine power; and adds from himſelf to the text which he quotes the following words, which are not in Plato, or FROM AN ANTECEDENT NON-EXISTENCE BROUGHT FORTH INTO BEING! That the incomparable author intended to deceive his reader, we are far from imagining: his zeal for Platoniſm had deceived himſelf. Plato's definition comprehends the δυναμιν ποιητικην † as well of man as of God; and therefore cannot infer a creative power anywhere, unleſs the father of the academy was ſo very abſurd as to ſuppoſe human artiſts the creators of thoſe machines which they have invented and made! Moſheim thinks that Cudworth was miſled by too implicit a confidence in *Ficinus;* and it is not impoſſible that Dr Ogilvie may have been ſwayed by the authority, great indeed, of the author of the Intellectual Syſtem.

Platoniſm.

* *Sophiſta*, p. 168.

† *Moſch. ed. Cud. Syſt. Intel.* cap. 4. § 23. n. 11.

That intellect exiſted antecedent to all bodies is indeed a Platonic dogma, from which Dr Ogilvie, after Cudworth, wiſhes to infer that the doctrine of the creation was taught in the academy; but Dr Ogilvie knows, and no man knew better than Cudworth, that Plato, with every other Greek philoſopher, diſtinguiſhed between *body* and *matter;* and that though he held the priority of intellect to the former, it by no means follows that he believed it to have exiſted antecedent to the latter. That he believed *mind*, or rather *ſoul* (for he diſtinguiſhes between the two), to be the cauſe or principle of motion, cannot be denied; but we are not therefore authoriſed to conclude, that he likewiſe believed it to be the cauſe of the exiſtence of matter. That he believed mind to be the moſt ancient of *all things*, taking the word *things* in the moſt abſolute ſenſe, cannot be true, ſince by Dr Ogilvie's own acknowledgement he held the exiſtence and eternity of *ideas*, not to add that he believed το ἑν or τἀγαθον—the firſt hypoſtaſis in his trinity, to be ſuperior to mind and prior to it, though not in time, yet in the order of nature. When therefore he calls mind the moſt ancient of *all things*, he muſt be ſuppoſed to mean only, that it is more ancient than *all bodies* and inferior ſouls. It is no reflection on the character of Plato that he could not, by the efforts of his own reaſon, acquire any notion of a proper creation; ſince we, who have the advantage of his writings, and of writings

(A) Moſheim affirms that this quotation is nowhere to be found in the writings of Plato. He therefore at firſt ſuſpected that the learned author, in looking haſtily over Plato's 10th book *De Legibus*, had transferred to God what is there ſaid of the *anima mundi*, leading by its own motions every thing in the heaven, the earth, and the ſea, and that he had added ſomething of his own. He dropped that opinion, however, when he found Plato, in the 10th book of his Republic, declaring it to be as "eaſy for God to produce the ſun, moon, ſtars, and earth, &c. from himſelf, as it is for us to produce the image of ourſelves, and whatever elſe we pleaſe, only by interpoſing a looking glaſs." In all this power, however, there is nothing ſimilar to that of creation.

Platonism. writings infinitely more valuable, to instruct us, find it extremely difficult, if not impossible, to conceive how any thing can begin to be. We believe the fact on the authority of revelation; but should certainly have never agitated such a question, had it not been stated to us by writers inspired with celestial wisdom.

In the Platonic cosmogony we cannot therefore doubt but that the eternity of the ὑλη πρωτη was taken for granted. Whether it was an eternal and necessary emanation from an eternal mind, is not perhaps quite so evident, though our own opinion is, that it was believed to be self-existent. But be this as it may, which is not worth disputing, one thing is certain, that Plato did not believe it to have a single form or quality which it did not receive either from the *Demiurgus* or the *Psyche*—the second or third person of this trinity. Except Aristotle, all the Greek philosophers, who were not materialists, held nearly the same opinions respecting the origin of the world; so that in examining their systems we shall be greatly misled if we understand the terms *incorporeal* and *immaterial* as at all synonymous. It was also a doctrine of Plato, that there is in matter a necessary but blind and refractory force; and that hence arises a propensity in matter to disorder and deformity, which is the cause of all the imperfection which appears in the works of God, and the origin of evil. On this subject Plato writes with wonderful obscurity: but, as far as we are able to trace his conceptions, he appears to have thought, that matter, from its nature, resists the will of the Supreme Artificer, so that he cannot perfectly execute his designs; and that this is the cause of the mixture of good and evil which is found in the material world.

Plato, however, was no materialist. He taught, that there is an intelligent cause, which is the origin of all spiritual being, and the former of the material world. The nature of this great being he pronounced it difficult to discover, and when discovered, impossible to divulge. The existence of God he inferred from the marks of intelligence, which appear in the form and arrangement of bodies in the visible world: and from the unity of the material system he concluded, that the mind by which it was formed must be one. God, according to Plato, is the supreme intelligence, incorporeal, without beginning, end, or change, and capable of being perceived only by the mind. He certainly distinguished the Deity not only from body, and whatever has corporeal qualities, but from matter itself, from which all things are made. He also ascribed to him all those qualities which modern philosophers ascribe to immaterial substance: and conceived him to be in his nature simple, uncircumscribed in space, the author of all regulated motion, and, in fine, possessed of intelligence in the highest perfection.

His notions of God are indeed exceedingly refined, and such as it is difficult to suppose that he could ever have acquired but from some obscure remains of primeval tradition, gleaned perhaps from the priests of Egypt or from the philosophers of the East. In the Divine Nature he certainly believed that there are two, and probably that there are three, *hypostases*, whom he called το ον and το ἑν, νους and ψυχη. The first he considered as self-existent, and elevated far above all mind and all knowledge; calling him, by way of eminence, *the being*, or *the one*. The only attribute which he acknowledged in this person was goodness; and therefore he frequently styles him το αγαθον—*the good*, or *essential goodness*. The second he considered as mind, the *wisdom* or *reason* of the first, and the *maker of the world*; and therefore he styles him νους, λογος, and δημιουργος. The third he always speaks of as the *soul of the world*; and hence calls him ψυχη, or ψυχη του κοσμου. He taught that the *second* is a necessary emanation from the *first*, and the *third* from the *second*, or perhaps from the *first* and *second*.

Some have indeed pretended, that the *Trinity*, which is commonly called *Platonic*, was a fiction of the later Platonists, unknown to the founder of the school: but any person who shall take the trouble to study the writings of Plato, will find abundant evidence that he really asserted a triad of divine hypostases, all concerned in the formation and government of the world. Thus in his 10th book of Laws, where he undertakes to prove the existence of a Deity in opposition to atheists, he ascends no higher in the demonstration than to the ψυχη or mundane soul, which he held to be the immediate and proper cause of all the motion that is in the world. But in other parts of his writings he frequently asserts, as superior to the self-moving principle, an immoveable νους or intellect, which was properly the *demiurgus* or framer of the world; and above this *hypostasis* one most simple and absolutely perfect being, who is considered in his *Theology* as αυθοθεος, the *original deity*, in contradistinction from the others, who are only θεοι εκ θεου. These doctrines are to be gathered from his works at large, particularly from the *Timæus*, *Philebus*, *Sophista* and *Epinomis*: but there is a passage in his second epistle to Dionysius, apparently written in answer to a letter, in which that monarch had required him to give a more explicit account than he had formerly done of the nature of God, in which the doctrine of a Trinity seems to be directly asserted. "After having said that he meant to wrap up his meaning in such obscurity, as that an adept only should fully comprehend it, he adds expressions to the following import: 'The Lord of Nature is surrounded on all sides by his works: whatever is exists by his permission: he is the fountain and source of excellence: around the second person are placed things of the second order; and around the third those of the third degree (B).'" Of this obscure passage a very satisfactory explanation is given in Dr Ogilvie's *Theology of Plato*, to which the narrow limits prescribed to such articles as this compel us to refer the reader. We shall only say, that the account which we have given of the Platonic trinity is ably supported by the doctor.

In treating of the eternal emanation of the second and third hypostases from the first, the philosophers of the academy compare them to light and heat proceeding from the sun. Plato himself, as quoted by Dr Cudworth, illustrates his doctrine by the same comparison.

(B) "Περι των παντων βασιλεα, παντ' εϛι και Εκεινου ενεκα παντα. Εκεινος αιτια παντων των καλων. Δευτερον δε περι τα δευτερα, και τριτον περι τα τριτα. Oper. p. 1269.

For "τ'αγαθον, or the firſt hypoſtaſis, is in the intellectual world the ſame (he ſays) to intellect and intelligibles that the ſun is in the corporeal world to viſion and viſibles; for as the ſun is not viſion itſelf but the cauſe of viſion, and as that light by which we ſee is not the ſun but only a thing like the ſun; ſo neither is the Supreme or Higheſt Good properly knowledge, but the cauſe of knowledge; nor is intellect, conſidered as ſuch, the beſt and moſt perfect being, but only a being having the form of perfection." Again, "as the ſun cauſes other things not only to become viſible but alſo to be generated, ſo the Supreme Good gives to things not only their capability of being known, but alſo their very eſſences by which they ſubſiſt; for this fountain of the Deity, this higheſt good, is not itſelf properly eſſence, but above eſſence, tranſcending it in reſpect both of dignity and of power."

The reſemblance which this trinity of Plato bears to that revealed in the goſpel muſt be obſerved by every attentive reader; but the two doctrines are likewiſe in ſome reſpects exceedingly diſſimilar. The third hypoſtaſis in the Platonic ſyſtem appears in no point of view co-ordinate with the firſt or ſecond. Indeed the firſt is elevated far above the ſecond, and the third ſunk ſtill farther beneath it, being conſidered as a mere ſoul immerſed in matter, and forming with the corporeal world, to which it is united, one compound animal. Nay, it does not appear perfectly clear, that Plato conſidered his ψυχη του κοσμου as a pure ſpirit, or as having ſubſiſted from eternity as a diſtinct *Hypoſtaſis*. "This governing ſpirit, of whom the earth, properly ſo called, is the body, conſiſted, according to our author's philoſophy, of the ſame and the other; that is, of the firſt matter, and of pure intelligence, framed to actuate the machinery of nature. The Supreme Being placed him in the middle of the earth; which, in the vivid idea of Plato, ſeemed itſelf to live, in conſequence of an influence that was felt in every part of it. From this ſeat his power is repreſented as being extended on all ſides to the utmoſt limit of the heavens; conferring life, and preſerving harmony in the various and complicated parts of the univerſe. Upon this being God is ſaid to have looked with peculiar complacency after having formed him as an image of himſelf, and to have given beauty and perfect proportion to the manſion which he was deſtined to occupy. According to the doctrine of Timæus, the Supreme Being ſtruck out from this original mind innumerable ſpirits of inferior order, endowed with principles of reaſon; and he committed to divinities of ſecondary rank the taſk of inveſting theſe in material forms, and of diſperſing them as inhabitants of the ſun, moon, and other celeſtial bodies. He taught alſo, that at death the human ſoul is reunited to the ψυχη του κοσμου, as to the ſource from which it originally came."

Such is the third perſon of the Platonic triad, as we find his nature and attributes very accurately ſtated by Dr Ogilvie; and the Chriſtian philoſopher, who has no particular ſyſtem to ſupport, will not require another proof that the triad of Plato differs exceedingly from the Trinity of the Scriptures. Indeed the third hypoſtaſis in this triad has ſo much the appearance of all that the ancients could mean by that which we call a *creature*, that the learned Cudworth, who wiſhed, it is difficult to conceive for what reaſon, to find the ſublimeſt myſtery of the Chriſtian faith explicitly taught in the writings of a pagan philoſopher, was forced to ſuppoſe that Plato held a double ψυχη, or ſoul, one εγκοσμιον, incorporated with the material world, and the other υπερκοσμιον or *ſupramundane*, which is not the ſoul but the governor of the univerſe. We call this a mere hypotheſis; for though the author diſplays vaſt erudition, and adduces many quotations in which this double *pſyche* is plainly mentioned, yet all thoſe quotations are taken from Platoniſts who lived after the propagation of the goſpel, and who, calling themſelves *eclectics*, freely ſtole from every ſect ſuch dogmas as they could incorporate with their own ſyſtem, and then attributed thoſe dogmas to their maſter. In the writings of Plato himſelf, there is not ſo much as an alluſion to this ſupramundane *pſyche**; and it is for this reaſon (the ψυχη, of which he treats being ſo very inferior to the δημιουργος and αγαθον) that we have expreſſed with heſitation his belief of *three* hypoſtaſes in the divine nature. Yet that he did admit ſo many, ſeems more than probable both from the paſſage illuſtrated by Dr Ogilvie, and from the attempt of Plotinus, one of his followers, to demonſtrate that the number can be neither greater nor leſs. That his doctrine on this ſubject ſhould be inaccurate and erroneous, can excite no wonder; whilſt it muſt be confeſſed to have ſuch a reſemblance to the truth, and to be ſo incapable of being proved by reaſoning from effects to cauſes, that we could not doubt of his having inherited it by tradition, even though we had not complete evidence that ſomething very ſimilar to it was taught long before him, not only by Pythagoras and Parmenides, but by the philoſophers of the eaſt.

* *Moſh. ed. Cud. Syſt. Intel.* c. 4. § 36. n. 43.

We have ſaid that the Demiurgus was the maker of the world from the firſt matter which had exiſted from eternity; but in Plato's coſmogony there is another principle, more myſterious, if poſſible, than any thing which we have yet mentioned. This is his intellectual ſyſtem of *ideas*, which it is not eaſy to collect from his writings, whether he conſidered as *independent* exiſtences, or only as archetypal *forms*, which had ſubſiſted from eternity in the λογος or divine intellect. On this ſubject he writes with ſuch exceeding obſcurity, that men of the firſt eminence, both among the ancients and the moderns, have differed about his real meaning. Some have ſuppoſed, that by *ideas* he meant real beings ſubſiſting from eternity, independent of all minds, and ſeparate from all matter; and that of theſe ideas he conceived ſome to be living and others to be without life. In this manner his doctrine is interpreted by Tertullian* among the ancients, and by the celebrated Brucker † among the moderns; and not by them only, but by many others equally learned, candid, and acute. Cudworth, on the other hand, with his annotator Moſheim, contend, that by his ideal world Plato meant nothing more than that there exiſted from eternity in the λογος or mind of God a notion or conception of every thing which was in time to be made. This is certainly much more probable in itſelf, than that a man of enlarged underſtanding ſhould have ſuppoſed, that there are ſomewhere in extramundane ſpace real living incorporeal beings eating and drinking, which are the *ideas* of all the animals which ever have been or ever will be eating and drinking in this world. Yet Moſheim candidly acknowledges, that if the controverſy were to be decided by the votes of the learned, he is doubtful whether it would be given for or againſt him; and Cudworth, though he pleads

* *Lib. de Anima.*
† *Hiſtor. Doctrin. de Ideis.*

Platonism. pleads the cause of his master with much ingenuity, owns, that on this subject his language cannot be vindicated. This indeed is most true; for Plato contends, that his ideas are not only the objects of science, but also the proper or physical causes of all things here below; that the *idea* of similitude is the *cause* of the resemblance between two globes; and the idea of dissimilitude the cause that a globe does not resemble a pyramid: he likewise calls them ουσιας, *essences* or *substances*, and many of his followers have pronounced them to be *animals*.

These wonderful expressions incline us to adopt with some hesitation the opinion stated by Dr Enfield. This historian of philosophy having observed, that some of the admirers of Plato contend, that by ideas existing in the reason of God, nothing more is meant than conceptions formed in the Divine mind, controverts this opinion with much effect. "By ideas, Plato (says he) appears to have meant something much more mysterious; namely, patterns or archetypes subsisting by themselves, as real beings, οντως οντα in the Divine reason, as in their original and eternal region, and issuing thence to give form to sensible things, and to become objects of contemplation and science to rational beings. It is the doctrine of the Timæus, that ὁ λογισμος τȣ Θεȣ, the reason of God, comprehends exemplars of all things, and that this reason is one of the primary causes of things. Plutarch says, that Plato supposes three principles, God, Matter, and Idea. Justin Martyr, Pseudo-Origen, and others, assert the same thing.

"That this is the true Platonic doctrine of ideas will appear probable, if we attend to the manner in which Plato framed his system of opinions concerning the origin of things. 'Having been from his youth (says Aristotle) conversant with Cratylus, a disciple of Heraclitus, and instructed in the doctrine of that school, that all sensible things are variable, and cannot be proper objects of science, he reasonably concluded, that if there be any such thing as science, there must exist, besides sensible objects, certain permanent natures, perceptible only by the intellect.' Such natures, divine in their origin, and eternal and immutable in their existence, he admitted into his system, and called them *ideas*. Visible things were regarded by Plato as fleeting shades, and ideas as the only permanent substances. These he conceived to be the proper objects of science to a mind raised by divine contemplation above the perpetually varying scenes of the material world."

It was a fundamental doctrine in the system of Plato, that the Deity formed the material world after a perfect model, consisting of those ideas which had eternally subsisted in his own reason; and yet, with some appearance of contradiction, he calls this model "*self*-existent, indivisible, and eternally *generated*." Nay, he talks of it as being intelligent as well as eternal, and wholly different from the transcripts, which are subjected to our inspection. There is so much mystery, confusion, and apparent absurdity, in the whole of this system, as it has come down to us, that we must suppose the friends of Plato to have been entrusted with a key to his esoteric doctrines, which has long been lost, otherwise it would be difficult to conceive how that philosopher could have had so many admirers.

With almost every ancient theist of Greece the founder of the academy believed in an order of beings called *dæmons*, which were superior to the souls of men, and Platonism. struck off by the Demiurgus from the soul of the world. Of these the reader will find some account elsewhere: (see DÆMON and POLYTHEISM). We mention them at present because they make an important appearance in Plato's system of physics, which was built upon them and upon the doctrine which has been stated concerning God, matter, and ideas. He taught, that the visible world was formed by the Supreme Architect, uniting eternal and immutable ideas to the first matter; that the universe is one animated being*, including within its limits all animated natures; that, in the formation of the visible and tangible world, fire and earth were first formed, and were afterwards united by means of air and water; and from perfect parts one perfect whole was produced, of a spherical figure, as most beautiful in itself, and best suited to contain all other figures†; that the elementary parts of the world are of regular geometrical forms, the particles of earth being cubical, those of fire pyramidical, those of air in the form of an octohedron, and those of water in that of an icosohedron; that these are adjusted in number, measure, and power, in perfect conformity to the geometrical laws of proportion; that the soul which pervades this sphere is the cause of its revolution round its centre; and, lastly, that the world will remain for ever, but that by the action of its animating principle, it accomplishes certain periods, within which every thing returns to its ancient place and state. This periodical revolution of nature is called the *Platonic* or *great year*. See the preceding article.

* *Timæus.*

† *Ibid.*

The metaphysical doctrines of Plato, which treat of the human soul, and the principles of his system of ethics, have been detailed in other articles (See METAPHYSICS, Part III. chap. iv.; and MORAL *Philosophy*, N° 6.): but it is worthy of observation in this place, that, preparatory to the study of all philosophy, he required from his disciples a knowledge of the elements of mathematics. In his Republic, he makes Glaucus, one of the speakers, recommend them for their usefulness in human life. "Arithmetic for accounts and distributions; geometry for encampments and mensurations; music for solemn festivals in honour of the gods; and astronomy for agriculture, for navigation, and the like. Socrates, on his part, denies not the truth of all this, but still insinuates that they were capable of answering an end more sublime. 'You are pleasant (says he) in your seeming to fear the multitude, lest you should be thought to enjoin certain sciences that are useless. 'Tis indeed no contemptible matter, though a difficult one, to believe, that through these particular sciences the soul has an organ purified and enlightened, which is destroyed and blinded by studies of other kinds; an organ better worth saving than a thousand eyes, in as much as *truth* becomes visible through *this alone*."

"Concerning policy, Plato has written at large in his Republic and in his Dialogue on Laws. He was so much enamoured with his own conceptions on this subject, that it was chiefly the hope of having an opportunity to realise his plan of a republic which induced him to visit the court of Dionysius. But they who are conversant with mankind, and capable of calmly investigating the springs of human actions, will easily perceive that his projects were chimerical, and could only have originated in a mind replete with philosophical enthusiasm. Of this nothing can be a clearer proof than the design of admitting

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ting in his republic a community of women, in order to give reason an entire controul over desire. The main object of his political institutions appears to have been, the subjugation of the passions and appetites, by means of the abstract contemplation of ideas. A system of policy, raised upon such fanciful grounds, cannot merit a more distinct consideration."

Such is genuine Platonism as it was taught in the old academy by the founder of the school and his immediate followers; but when Arcesilaus was placed at the head of the academics, great innovations were introduced both into their doctrines and into their mode of teaching (see ARCESILAUS). This man was therefore considered as the founder of what was afterwards called the *middle* academy. Being a professed sceptic, he carried his maxim of uncertainty to such a height, as to alarm the general body of philosophers, offend the governors of the state, and bring just odium upon the very name of the academy. At length *Carneades*, one of the disciples of this school, relinquishing some of the more obnoxious tenets of Arcesilaus, founded what has been called the *new* academy with very little improvement on the principles of the middle. See CARNEADES.

Under one or other of these forms Platonism found its way into the Roman republic. Cicero was a Platonist, and one of the greatest ornaments of the school. A school of Platonists was likewise founded in Alexandria in the second century of the Christian era; but their doctrines differed in many particulars from those taught in the three academies. They professed to seek truth wherever they could find it, and to collect their dogmas from every school. They endeavoured to bend some of the principles of Plato into a conformity with the doctrines of the gospel; and they incorporated with the whole many of the maxims of Aristotle and Zeno, and not a few of the fictions of the east. Their system was therefore extremely heterogeneous, and seldom so rational as that of the philosopher after whose name they were called, and of whose doctrines we have given so copious a detail. See AMMONIUS, ECCLECTICS, and PLOTINUS.

PLAUTUS, MARCUS ACCIUS, a comic writer of ancient Rome, born in Umbria, a province of Italy. His proper name was *Marcus Accius*, and he is supposed to have acquired the surname of *Plautus* from having splay feet. His parentage appears to have been mean; so that some have thought he was the son of a slave. Aulus Gellius says that Plautus was distinguished for his poetry on the theatre, and Cato for his eloquence in the forum, at the same time; and observes elsewhere from Varro, that he was so well paid for his plays as to double his stock in trading, in which he lost all he gained by the muses. He is said to have been reduced to work at a mill for his subsistence; but Varro adds, that his wit was his best support, as he composed three of his plays during this drudgery. He died in the first year of the elder Cato's censorship, about the year of Rome 569, and 184 before Christ. We have 20 of his plays extant, though not all of them entire. Five of them comedies, have been elegantly translated into English by Mr B. Thornton, and published in 2 vols 8vo, 1767.

PLAYS. See the following article.

PLAYHOUSE. See THEATRE, AMPHITHEATRE, &c. The most ancient English playhouses were the Curtain in Shoreditch and the Theatre. In the time of Shakespeare, who commenced a dramatic writer in 1592, there were no less than 10 theatres open. Four of these were private houses, viz. that in Blackfriars, the Cockpit or Phœnix in Drury-Lane, a theatre in Whitefriars, and one in Salisbury court. The other six were called public theatres, viz. the Globe, the Swan, the Rose, and the Hope, on the Bank-side; the Red Bull, at the upper end of St John's street, and the Fortune in White-cross street. The two last were chiefly frequented by citizens. Mr Malone gives us a pretty copious account of these playhouses, in a supplement to his last edition of Shakespeare, which we shall here insert.

Playhouse.

"Most, if not all (says he) of Shakespeare's plays were performed either at the Globe or at the Theatre in Blackfriars. It appears that they both belonged to the same company of comedians, viz. his majesty's servants, which title they assumed, after a licence had been granted to them by King James in 1603, having before that time been called the servants of the lord chamberlain.

"The theatre in Blackfriars was a private house; but the peculiar and distinguishing marks of a private playhouse it is not easy to ascertain. It was very small, and plays were there usually represented by candle light. The Globe, situated on the southern side of the river Thames, was a hexagonal building, partly open to the weather, partly covered with reeds. It was a public theatre, and of considerable size, and there they always acted by daylight. On the roof of the Globe, and the other public theatres, a pole was erected, to which a flag was affixed. These flags were probably displayed only during the hours of exhibition; and it should seem from a passage in one of the old comedies that they were taking down during Lent, in which season no plays were presented. The Globe, though hexagonal at the outside, was probably a rotunda within, and perhaps had its name from its circular form. It might, however, have been denominated only from its sign, which was a figure of Hercules supporting the Globe. This theatre was burnt down in 1613, but it was rebuilt in the following year, and decorated with more ornament than had been originally bestowed upon it. The exhibitions at the Globe seem to have been calculated chiefly for the lower class of people; those at Blackfriars for a more select and judicious audience.

"A writer informs us, that one of these theatres was a winter and the other a summer house. As the Globe was partly exposed to the weather, and they acted there usually by daylight, it was probably the summer theatre. The exhibitions here seem to have been more frequent than at Blackfriars, at least till the year 1604 or 1605, when the Bank-side appears to have become less fashionable and less frequented than it formerly had been. Many of our ancient dramatic pieces were performed in the yards of carriers inns; in which, in the beginning of Queen Elizabeth's reign, the comedians, who then first united themselves in companies, erected an occasional stage. The form of these temporary playhouses seems to be preserved in our modern theatre. The galleries are in both ranged over each other on three sides of the building. The small rooms under the lowest of these galleries answer to our present boxes; and it is observable that these, even in theatres which were

Playhouſe. were built in a ſubſequent period expreſsly for dramatic exhibitions, ſtill retained their old name, and are frequently called rooms by our ancient writers. The yard bears a ſufficient reſemblance to the pit as at preſent in uſe. We may ſuppoſe the ſtage to have been raiſed in this area, on the fourth ſide, with its back to the gateway of the inn, at which the money for admiſſion was taken. Hence, in the middle of the Globe, and I ſuppoſe of the other public theatres, in the time of Shakeſpeare, there was an open yard or area, where the common people ſtood to ſee the exhibition; from which circumſtance they are called by our author groundlings, and by Ben Jonſon 'the underſtanding gentlemen of the ground.'

"In the ancient playhouſes there appears to have been a private box, of which it is not eaſy to aſcertain the ſituation. It ſeems to have been placed at the ſide of the ſtage towards the rear, and to have been at a lower price: in this ſome people ſat, either from economy or ſingularity. The galleries, or ſcaffolds as they are ſometimes called, and that part of the houſe which in private theatres was named the pit, ſeem to have been at the ſame price; and probably in houſes of reputation, ſuch as the Globe, and that in Blackfriars, the price of admiſſion into thoſe parts of the theatre was 6d. while in ſome meaner playhouſes it was only 1d. in others only 2d. The price of admiſſion into the beſt rooms or boxes was, I believe, in our author's time, 1s.; though afterwards it appears to have riſen to 2s. and half-a-crown.

"From ſeveral paſſages in our old plays, we learn, that ſpectators were admitted on the ſtage, and that the critics and wits of the time uſually ſat there. Some were placed on the ground; others ſat on ſtools, of which the price was either 6d. or 1s. according, I ſuppoſe, to the commodiouſneſs of the ſituation; and they were attended by pages, who furniſhed them with pipes and tobacco, which was ſmoked here as well as in other parts of the houſe: yet it ſhould ſeem that perſons were ſuffered to ſit on the ſtage only in the private playhouſes, ſuch as Blackfriars, &c. where the audience was more ſelect, and of a higher claſs; and that in the Globe and other public theatres no ſuch licence was permitted.

"The ſtage was ſtrewed with ruſhes, which, as we learn from Hentzner and Caius de Ephemera, was, in the time of Shakeſpeare, the uſual covering of floors in England. The curtain which hangs in the front of the preſent ſtage, drawn up by lines and pulleys, though not a modern invention, for it was uſed by Inigo Jones in the maſques at court, was yet an apparatus to which the ſimple mechaniſm of our ancient theatres had not arrived, for in them the curtains opened in the middle, and were drawn backwards and forwards on an iron rod. In ſome playhouſes they were woollen, in others made of ſilk.— Towards the rear of the ſtage there appears to have been a balcony, the platform of which was probably eight or ten feet from the ground. I ſuppoſe it to have been ſupported by pillars. From hence, in many of our old plays, part of the dialogue was ſpoken; and in the front of this balcony curtains likewiſe were hung.

"A doubt has been entertained whether in our ancient theatres there were ſide and other ſcenes. The queſtion is involved in ſo much obſcurity, that it is very difficult to form any decided opinion upon it. It is certain, that in the year 1695 Inigo Jones exhibited an entertainment at Oxford, in which moveable ſcenes were uſed; but he appears to have introduced ſeveral pieces of machinery in the maſques at court, with which undoubtedly the public theatres were unacquainted. A paſſage which has been produced from one of the old comedies, proves, it muſt be owned, that even theſe were furniſhed with ſome pieces of machinery, which were uſed when it was requiſite to exhibit the deſcent of ſome god or ſaint; but from all the contemporary accounts, I am inclined to believe that the mechaniſm of our ancient ſtage ſeldom went beyond a painted chair or a trap-door, and that few, if any of them, had any moveable ſcenes. When King Henry VIII. is to be diſcovered by the dukes of Suffolk and Norfolk, reading in his ſtudy, the ſcenical direction in the firſt folio, 1623, which was printed apparently from playhouſe copies, is, 'the king draws the curtain, (i. e. draws it open), and ſits reading penſively;' for, beſides the principal curtains that hung in the front of the ſtage, they uſed others as ſubſtitutes for ſcenes. If a bed-chamber is to be exhibited, no change of ſcene is mentioned; but the property-man is ſimply ordered to thruſt forth a bed. When the fable requires the Roman capitol to be exhibited, we find two officers enter, 'to lay cuſhions, as it were, in the capitol,' &c. On the whole, it appears, that our ancient theatres, in general, were only furniſhed with curtains, and a ſingle ſcene compoſed of tapeſtry, which were ſometimes, perhaps, ornamented with pictures; and ſome paſſages in our old dramas incline one to think, that when tragedies were performed the ſtage was hung with black. Playhouſe.

"In the early part, at leaſt, of our author's * acquaintance with the theatre, the want of ſcenery ſeems to have been ſupplied by the ſimple expedient of writing the names of the different places where the ſcene was laid in the progreſs of the play, which were diſpoſed in ſuch a manner as to be viſible to the audience. The invention of trap-doors, however, appears not to be modern; for in an old *morality*, intitled *All for Money*, we find a marginal direction which implies that they were very early in uſe. The covering, or internal roof of the ſtage, was anciently termed the heavens. It was probably painted of a ſky-blue colour, or perhaps pieces of drapery tinged with blue were ſuſpended acroſs the ſtage to repreſent the heavens.

* *Shakeſpeare.*

"It is probable that the ſtage was formerly lighted by two large branches, of a form ſimilar to thoſe now hung in churches. They gave place in a ſubſequent period to ſmall circular wooden frames, furniſhed with candles, eight of which were hung on the ſtage, four at either ſide, and theſe within a few years were wholly removed by Mr Garrick, who, on his return from France, firſt introduced the preſent commodious method of illuminating the ſtage by lights not viſible to the audience. Many of the companies of players were formerly ſo thin, that one perſon played two or three parts; and a battle on which the fate of an empire was ſuppoſed to depend was decided by half a dozen combatants. It appears to have been a common practice in their mock engagements to diſcharge ſmall pieces of ordnance on the ſtage. Before the exhibition began, three flouriſhes or pieces of muſic were played, or, in the ancient language, there were three ſoundings. Muſic was likewiſe played between the acts. The inſtruments chiefly uſed were trumpets, cornets, and hautboys.

hautboys. The band, which did not conſiſt of more than five or ſix performers, ſat in an upper balcony, over what is now called the ſtage-box.

"The perſon who ſpoke the prologue was uſhered in by trumpets, and uſually wore a long black velvet cloak, which, I ſuppoſe, was conſidered as beſt ſuited to a ſupplicatory addreſs. Of this cuſtom, whatever might have been its origin, ſome traces remained till very lately, a black coat having been, if I miſtake not, within theſe few years, the conſtant ſtage-habiliment of our modern prologue-ſpeakers. The dreſs of the ancient prologue-ſpeaker is ſtill retained in the play that is exhibited in Hamlet before the king and court of Denmark. The performers of male characters generally wore periwigs, which in the age of Shakeſpeare were not in common uſe. It appears from a paſſage in Puttenham's *Art of Engliſh Poeſy*, 1589, that vizards were on ſome occaſions uſed by the actors of thoſe days; and it may be inferred, from a ſcene in one of our author's comedies, that they were ſometimes worn in his time by thoſe who performed female characters; but this I imagine was very rare. Some of the female part of the audience likewiſe appeared in maſks. The ſtage-dreſſes, it is reaſonable to ſuppoſe, were much more coſtly at ſome theatres than at others; yet the wardrobe of even the king's ſervants at the Globe and Blackfriars, was, we find, but ſcantily furniſhed; and our author's dramas derived very little aid from the ſplendour of exhibition.

"It is well known, that in the time of Shakeſpeare, and for many years afterwards, female characters were repreſented by boys or young men. Sir William d'Avenant, in imitation of the foreign theatres, firſt introduced females in the ſcene, and Mrs Betterton is ſaid to have been the firſt woman that appeared on the Engliſh ſtage. Andrew Pennycuike played the part of Matilda in a tragedy of Davenport's, in 1655; and Mr Kynaſton acted ſeveral female parts after the Reſtoration. Downes, a contemporary of his, aſſures us, 'that being then very young he made a complete ſtage beauty, performing his parts ſo well, particularly Arthiope and Aglaura, that it has ſince been diſputable among the judicious whether any woman that ſucceeded him touched the audience ſo ſenſibly as he.'

"Both the prompter, or book-holder, as he was ſometimes called, and the property-man, appear to have been regular appendages of our ancient theatres. No writer that I have met with intimates, that in the time of Shakeſpeare it was cuſtomary to exhibit more than a ſingle dramatic piece in one day. The Yorkſhire tragedy, or *All's One*, indeed, appears to have been one of four pieces that were repreſented on the ſame day; and Fletcher has alſo a piece called *Four Plays in One*; but probably theſe were either exhibited on ſome particular occaſion, or were ineffectual efforts to introduce a new ſpecies of amuſement; for we do not find any other inſtances of the ſame kind. Had any ſhorter pieces been exhibited after the principal performance, ſome of them probably would have been printed: but there are none extant of an earlier date than the time of the Reſtoration. The practice, therefore, of exhibiting two dramas ſucceſſively in the ſame evening, we may be aſſured was not eſtabliſhed before that period. But though the audiences in the time of our author were not gratified by the repreſentation of more than one drama in the ſame day, the entertainment was diverſified, and the populace diverted, by vaulting, tumbling, ſlight of hand, and morris-dancing, a mixture not much more heterogeneous than that with which we are daily preſented, a tragedy and a farce.

"The amuſements of our anceſtors, before the commencement of the play, were of various kinds, ſuch as reading, playing cards, drinking ale, or ſmoking tobacco. It was a common practice to carry table-books to the theatre, and either from curioſity or enmity to the author, or ſome other motive, to write down paſſages of the play that was repreſented: and there is reaſon to believe that the imperfect and mutilated copies of ſome of Shakeſpeare's dramas, which are yet extant, were taken down in ſhort-hand during the exhibition. At the end of the piece, the actors, in noblemen's houſes and in taverns, where plays were frequently performed, prayed for the health and proſperity of their patrons; and in the public theatres for the king and queen. This prayer ſometimes made part of the epilogue. Hence, probably, as Mr Steevens has obſerved, the addition of *Vivant rex et regina* to the modern play-bills.

"Plays, in the time of our author, began at one o'clock in the afternoon; and the exhibition was uſually finiſhed in two hours. Even in 1667 they commenced at three. When Goſſon wrote his *School of Abuſe*, in 1579, it ſeems the dramatic entertainments were uſually exhibited on Sundays. Afterwards they were performed on that and other days indiſcriminately. It appears from a contemporary writer, that exhibiting plays on Sunday had not been aboliſhed in the third year of King Charles I.

"The modes of conveyance to the theatre, anciently as at preſent, ſeem to have been various; ſome going in coaches, others on horſeback, and many by water.—To the Globe playhouſe the company probably were conveyed by water; to that in Blackfriars the gentry went either in coaches or on horſeback, and the common people on foot. In an epigram to Sir John Davis, the practice of riding to the theatre is ridiculed as a piece of affectation or vanity, and therefore we may preſume it was not very general.

"The long and whimſical titles that are prefixed to the quarto copies of our author's plays, I ſuppoſe to have been tranſcribed from the play-bills of the time. A contemporary writer has preſerved ſomething like a play-bill of thoſe days, which ſeems to corroborate this obſervation; for if it were diveſted of rhime, it would bear no very diſtant reſemblance to the title pages that ſtand before ſome of our author's dramas:

" ———Prithee, what's the play ?
" (The firſt I viſited this twelvemonth day)
" They ſay " A new invented play of Purle,
" That jeoparded his neck to ſteal a girl
" Of twelve; and lying faſt impounded for't,
" Has hither ſent his beard to act his part;
" Againſt all thoſe in open malice bent,
" That would not freely to the theft conſent:
" Feigns all to's wiſh, and in the epilogue
" Goes out applauded for a famous rogue."
" —Now hang me if I did not look at firſt
" For ſome ſuch ſtuff, by the fond people's thruſt."

"It is uncertain at what time the uſage of giving authors a benefit on the third day of the exhibition of their pieces commenced. Mr Oldys, in one of his manuſcripts, intimates that dramatic poets had anciently their benefit on the firſt day that a new play was repreſented; a regulation

Playhouſe. lation which would have been very favourable to ſome of the ephemeral productions of modern times. But for this there is not, I believe, any ſufficient authority. From D'Avenant, indeed, we learn, that in the latter part of the reign of Queen Elizabeth the poet had his benefit on the ſecond day. As it was a general practice in the time of Shakeſpeare to ſell the copy of the play to the theatre, I imagine in ſuch caſes an author derived no other advantage from his piece than what aroſe from the ſale of it. Sometimes, however, he found it more beneficial to retain the copyright in his own hands; and when he did ſo, I ſuppoſe he had a benefit. It is certain that the giving authors the profit of the third exhibition of their play, which ſeems to have been the uſual mode during almoſt the whole of the laſt century, was an eſtabliſhed cuſtom in the year 1612, for Decker, in the prologue to one of his comedies printed in that year, ſpeaks of the poet's third day. The unfortunate Otway had no more than one benefit on the production of a new play; and this too, it ſeems, he was ſometimes forced to mortgage before the piece was acted. Southerne was the firſt dramatic writer who obtained the emoluments ariſing from two repreſentations; and to Farquhar, in the year 1700, the benefit of a third was granted. When an author ſold his piece to the ſharers or proprietors of a theatre, it remained for ſeveral years unpubliſhed; but when that was not the caſe, he printed it for ſale, to which many ſeem to have been induced, from an apprehenſion that an imperfect copy might be iſſued from the preſs without their conſent. The cuſtomary price of the copy of a play in the time of Shakeſpeare appears to have been twenty nobles, or ſix pounds thirteen ſhillings and four pence. The play when printed was ſold for ſixpence; and the uſual preſent from a patron in return for a dedication was forty ſhillings. On the firſt day of exhibiting a new play, the prices of admiſſion appear to have been raiſed; and this ſeems to have been occaſionally practiſed on the benefit-nights of authors to the end of the laſt century. The cuſtom of paſſing a final cenſure on plays at their firſt exhibition is as ancient as the time of our author; for no leſs than three plays of his rival Ben Jonſon appear to have been damned; and Fletcher's Faithful Shepherdeſs, and The Knight of the Burning Peſtle, written by him and Beaumont, underwent the ſame fate.

"It is not eaſy to aſcertain what were the emoluments of a ſucceſsful actor in the time of Shakeſpeare. They had not then annual benefits as at preſent. The performers at each theatre ſeem to have ſhared the profits ariſing either from each day's exhibition or from the whole ſeaſon among them. From Ben Jonſon's Poetaſter we learn, that one of either the performers or proprietors had ſeven ſhares and a half; but of what integral ſum is not mentioned. From the prices of admiſſion into our ancient theatres, which have been already mentioned, I imagine the utmoſt that the ſharers of the Globe playhouſe could have received on any one day was about 35l. So lately as the year 1685, Shadwell received by his third day on the repreſentation of the Squire of Alſatia, 130l.; which Downes the prompter ſays was the greateſt receipt that had been ever taken at Drury-Lane playhouſe at ſingle prices. It appears from the MSS. of Lord Stanhope, treaſurer of the chambers to King James I. that the cuſtomary ſum paid to John Heminge and his company for the performance of a play at court was twenty nobles, or ſix pounds thirteen ſhillings and four pence. And Edward Alleyn mentions in his Diary, that he once had ſo ſlender an audience in his theatre called the *Fortune*, that the whole receipts of the houſe amounted to no more than three pounds and ſome odd ſhillings.

Playhouſe, Plea.

"Thus ſcanty and meagre were the apparatus and accommodations of our ancient theatres, on which thoſe dramas were firſt exhibited, that have ſince engaged the attention of ſo many learned men, and delighted ſo many thouſand ſpectators. Yet even then, we are told by a writer of that age, 'that dramatic poeſy was ſo lively expreſſed and repreſented on the public ſtages and theatres of this city, as Rome in the age of her pomp and glory never ſaw it better performed; in reſpect of the action and art, not of the coſt and ſumptuouſneſs."

PLEA, in *Law*, is what either party alleges for himſelf in court, in a cauſe there depending; and in a more reſtrained ſenſe, it is the defendant's anſwer to the plaintiff's declaration.

Pleas are uſually divided into thoſe of the crown and common pleas. Pleas of the crown are all ſuits in the king's name, or in the name of the attorney-general in behalf of the king, for offences committed againſt his crown and dignity, and againſt his peace; as treaſon, murder, felony, &c. See ARRAIGNMENT.

Common pleas are ſuch ſuits as are carried on between common perſons in civil caſes. Theſe pleas are of two ſorts; *dilatory* pleas, and pleas *to the action*. Dilatory pleas are ſuch as tend merely to delay or put off the ſuit, by queſtioning the propriety of the remedy, rather than by denying the injury: pleas to the action are ſuch as diſpute the very cauſe of ſuit. Blackſt. Comment.

I. *Dilatory* pleas are, 1. To the juriſdiction of the court: alleging, that it ought not to hold plea of this injury, it ariſing in Wales or beyond ſea: or becauſe the land in queſtion is of ancient demeſne, and ought only to be demanded in the lord's court, &c. 2. To the diſability of the plaintiff, by reaſon whereof he is incapable to commence or continue the ſuit; as, that he is an alien enemy, outlawed, excommunicated, attainted of treaſon or felony, under a præmunire, not *in rerum natura* (being only a fictitious perſon), an infant, a feme-covert, or a monk profeſſed. 3. In abatement: which abatement is either of the writ, or the count, for ſome defect in one of them; as by miſnaming the defendant, which is called a *miſnomer;* giving him a wrong addition, as eſquire inſtead of knight; or other want of form in any material reſpect. Or, it may be that the plaintiff is dead; for the death of either party is at once an abatement of the ſuit.

Theſe pleas to the juriſdiction, to the diſability, or in abatement, were formerly very often uſed as mere dilatory pleas, without any foundation in truth, and calculated only for delay; but now by ſtat. 4 & 5 Ann. c. 16. no dilatory plea is to be admitted without affidavit made of the truth thereof, or ſome probable matter ſhown to the court to induce them to believe it true. And with reſpect to the pleas themſelves, it is a rule, that no exception ſhall be admitted againſt a declaration or writ, unleſs the defendant will in the ſame plea give the plaintiff a better; that is, ſhow him how it might be amended, that there may not be two objections upon the ſame account.

All pleas to the juriſdiction conclude to the cognizance of the court; praying "judgment whether the court will have farther cognizance of the ſuit." Pleas to the diſability conclude to the perſon; by praying "judgment, if the ſaid A the plaintiff ought to be anſwered." And pleas in abatement (when the ſuit is by original) conclude to the writ, or declaration; by praying "judgment of the writ, or declaration, and that the ſame may be quaſhed," *caſſetur*, made void, or abated: but if the action be by bill, the plea muſt pray "judgement of the bill," and not of the declaration; the bill being here the original, and the declaration only a copy of the bill.

When theſe dilatory pleas are allowed, the cauſe is either diſmiſſed from that juriſdiction, or the plaintiff is ſtayed till his diſability be removed; or he is obliged to ſue out a new writ, by leave obtained from the court, or to amend and new-frame his declaration. But when, on the other hand, they are overruled as frivolous, the defendant has judgment of *reſpondeat ouſter*, or to anſwer over in ſome better manner. It is then incumbent on him to plead,

2. A plea *to the action;* that is, to anſwer to the merits of the complaint. This is done by confeſſing or denying it.

A confeſſion of the whole complaint is not very uſual; for then the defendant would probably end the matter ſooner, or not plead at all, but ſuffer judgment to go by default. Yet ſometimes, after tender and refuſal of a debt, if the creditor haraſſes his debtor with an action, it then becomes neceſſary for the defendant to acknowledge the debt, and plead the tender; adding, that he has always been ready, *tout temps priſt*, and is ſtill ready, *uncore priſt*, to diſcharge it: for a tender by the debtor and refuſal by the creditor will in all caſes diſcharge the coſts, but not the debt itſelf; though in ſome particular caſes the creditor will totally loſe his money. But frequently the defendant confeſſes one part of the complaint (by a *cognovit actionem* in reſpect thereof), and traverſes or denies the reſt; in order to avoid the expence of carrying that part to a formal trial, which he has no ground to litigate. A ſpecies of this ſort of confeſſion is the *payment of money into court:* which is for the moſt part neceſſary upon pleading a tender, and is itſelf a kind of tender to the plaintiff; by paying into the hands of the proper officer of the court as much as the defendant acknowledges to be due, together with the coſts hitherto incurred, in order to prevent the expence of any farther proceedings. This may be done upon what is called a *motion;* which is an occaſional application to the court by the parties or their counſel, in order to obtain ſome rule or order of court, which becomes neceſſary in the progreſs of a cauſe: and it is uſually grounded upon an *affidavit* (the perfect tenſe of the verb *affido*), being a voluntary oath before ſome judge or officer of the court, to evince the truth of certain facts, upon which the motion is grounded: though no ſuch affidavit is neceſſary for payment of money into court. If, after the money is paid in, the plaintiff proceeds in his ſuit, it is at his own peril: for if he does not prove more due than is ſo paid into court, he ſhall be nonſuited and pay the defendant's coſts; but he ſhall ſtill have the money ſo paid in, for that the defendant has acknowledged to be his due. To this head may alſo be referred the practice of what is called a *ſet off;* whereby the defendant acknowledges the juſtice of the plaintiff's demand on the one hand; but on the other, ſets up a demand of his own, to counterbalance that of the plaintiff, either in the whole or in part; as, if the plaintiff ſues for ten pounds due on a note of hand, the defendant may ſet off nine pounds due to himſelf for merchandiſe ſold to the plaintiff; and, in caſe he plead ſuch ſet-off, muſt pay the remaining balance into court.

Pleas that totally deny the cauſe of complaint are either the general iſſue, or a ſpecial plea in bar.

1. The *general iſſue*, or general plea, is what traverſes, thwarts, and denies at once, the whole declaration, without offering any ſpecial matter whereby to evade it. As in treſpaſs either *vi et armis*, or on the caſe, "*non culpabilis*, not guilty;" in debt upon contract, "*nihil debet*, he owes nothing;" in debt on bond, "*non eſt factum*, it is not his deed:" on an *aſſumpſit*, "*non aſſumpſit*, he made no ſuch promiſe." Or in real actions, "*nul tort*, no wrong done; *nul diſſeiſin*, no diſſeiſin;" and in a writ of right, the miſe or iſſue is, that "the tenant has more right to hold than the demandant has to demand." Theſe pleas are called the *general iſſue*, becauſe, by importing an abſolute and general denial of what is alleged in the declaration, they amount at once to an iſſue; by which we mean a fact affirmed on one ſide and denied on the other.

2. *Special* pleas in bar of the plaintiff's demands are very various, according to the circumſtances of the defendant's caſe. As, in real actions, a general releaſe or a fine; both of which may deſtroy and bar the plaintiff's title. Or, in perſonal actions, an accord, arbitration, conditions performed, nonage of the defendant, or ſome other fact which precludes the plaintiff from his action. A *juſtification* is likewiſe a ſpecial plea in bar; as in actions of aſſault and battery, *ſon aſſault demeſne*, that it was the plantiff's own original aſſault; in treſpaſs, that the defendant did the thing complained of in right of ſome office which warranted him ſo to do; or, in an action of ſlander, that the plaintiff is really as bad a man as the defendant ſaid he was.

Alſo a man may plead the ſtatutes of limitation in bar; or the time limited by certain acts of parliament, beyond which no plaintiff can lay his cauſe of action. This, by the ſtatute of 32 Hen. VIII. c. 2. in a writ of right is 60 years: in aſſizes, writs of entry, or other poſſeſſory actions real, of the ſeiſin of one's anceſtors in lands; and either of their ſeiſin, or one's own, in rents, ſuits, and ſervices, 50 years: and in actions real for lands grounded upon one's own ſeiſin or poſſeſſion, ſuch poſſeſſion muſt have been within 30 years. By ſtatute 1 Mar. ſt. 2. c. 5. this limitation does not extend to any ſuit for avowſons. But by the ſtatute 21 Jac. I. c. 2. a time of limitation was extended to the caſe of the king; viz. 60 years precedent to 19th Feb. 1623; but, this becoming ineffectual by efflux of time, the ſame date of limitation was fixed by ſtatute 9 Geo. III. c. 16. to commence and be reckoned backwards, from the time of bringing any ſuit or other proceſs to recover the thing in queſtion; ſo that a poſſeſſion for 60 years is now a bar even againſt the prerogative, in derogation of the ancient maxim, *Nullum tempus occurrit regi.* By another ſtatute, 21 Jac. I. c. 16. 20 years is the time of limitation in any writ of formedon: and, by a conſequence, 20 years is alſo the limitation in every action of ejectment; for no ejectment can be brought, unleſs where

Plea.

where the lessor of the plaintiff is entitled to enter on the lands, and by the statute 21 Jac. I. c. 16. no entry can be made by any man, unless within 20 years after his right shall accrue. Also all actions of trespass (*quare clausum fregit*, or otherwise), detinue, trover, replevin, account, and case (except upon accounts between merchants), debt on simple contract, or for arrears of rent, are limited by the statute last mentioned to six years after the cause of action commenced: and actions of assault, menace, battery, mayhem, and imprisonment, must be brought within four years, and actions for words two year[s], after the injury committed. And by the statute 21 Eliz. c. 5. all suits, indictments, and informations, upon any penal statutes, where any forfeiture is to the crown, shall be sued within two years, and where the forfeiture is to a subject, within one year, after the offence committed, unless where any other time is specially limited by the statute. Lastly, by statute 10 W. III. c. 14. no writ of error, *scire facias*, or other suit, shall be brought to reverse any judgement, fine, or recovery, for error, unless it be prosecuted within 20 years. The use of these statutes of limitation is to preserve the peace of the kingdom, and to prevent those innumerable perjuries which might ensue if a man were allowed to bring an action for any injury committed at any distance of time. Upon both these accounts the law therefore holds, that *interest reipublicæ ut sit finis litium*: and upon the same principle the Athenian laws in general prohibited all actions where the injury was committed five years before the complaint was made. If, therefore, in any suit, the injury, or cause of action, happened earlier than the period expressly limited by law, the defendant may plead the statutes of limitations in bar: as upon an *assumpsit*, or promise to pay money to the plaintiff, the defendant may plead, *Non assumpsit infra sex annos*, He made no such promise within six years; which is an effectual bar to the complaint.

An *estoppel* is likewise a special plea in bar; which happens where a man hath done some act, or executed some deed, which estops or precludes him from averring any thing to the contrary. As if a tenant for years (who hath no freehold) levies a fine to another person. Though this is void as to strangers, yet it shall work as an estoppel to the cognizor; for, if he afterwards brings an action to recover these lands, and his fine is pleaded against him, he shall thereby be estopped from saying, that he had no freehold at the time, and therefore was incapable of levying it.

The conditions and qualities of a plea (which, as well as the doctrine of estoppels, will also hold equally, *mutatis mutandis*, with regard to other parts of pleading), are, 1. That it be single and containing only one matter; for duplicity begets confusion. But by statute 4 and 5 Ann. c. 16. a man, with leave of the court, may plead two or more distinct matters or single pleas; as in an action of assault and battery, these three, Not guilty, *son assault demesne*, and the statute of limitations. 2. That it be direct and positive, and not argumentative. 3. That it have convenient certainty of time, place, and persons. 4. That it answer the plaintiff's allegations in every material point. 5. That it be so pleaded as to be capable of trial.

Special pleas are usually in the affirmative, sometimes in the negative, but they always advance some new fact not mentioned in the declaration; and then they must be averred to be true in the common form:—"And this he is ready to verify."—This is not necessary in pleas of the general issue, those always containing a total denial of the facts before advanced by the other party, and therefore putting him upon the proof of them. See PLEADINGS.

Plea.

PLEA to Indictment, the defensive matter alleged by a criminal on his indictment; (see ARRAIGNMENT). This is either, 1. A plea to the jurisdiction; 2. A demurrer; 3. A plea in abatement; 4. A special plea in bar; or, 5. The general issue. *Blackst. Comment.*

I. A plea to the *jurisdiction*, is where an indictment is taken before a court that hath no cognizance of the offence; as if a man be indicted for a rape at the sheriff's tourn, or for treason at the quarter-sessions: in these or similar cases, he may except to the jurisdiction of the court, without answering at all to the crime alleged.

II. A *demurrer* to the indictment, is incident to criminal cases, as well as civil, when the fact as alleged is allowed to be true, but the prisoner joins issue upon some point of law in the indictment, by which he insists, that the fact, as stated, is no felony, treason, or whatever the crime is alleged to be. Thus, for instance, if a man be indicted for feloniously stealing a greyhound; which is an animal in which no valuable property can be had, and therefore it is not felony, but only a civil trespass to steal it; in this case the party indicted may demur to the indictment; denying it to be felony, though he confesses the act of taking it. Some have held, that if, on demurrer, the point of law be adjudged against the prisoner, he shall have judgment and execution, as if convicted by verdict. But this is denied by others, who hold, that in such case he shall be directed and received to plead the general issue, Not guilty, after a demurrer determined against him. Which appears the more reasonable, because it is clear, that if the prisoner freely discovers the fact in court, and refers it to the opinion of the court whether it be felony or no; and upon the fact thus shown, it appears to be felony, the court will not record the confession, but admit him afterwards to plead not guilty. And this seems to be a case of the same nature, being for the most part a mistake in point of law, and in the conduct of his pleading; and, though a man by mispleading may in some cases lose his property, yet the law will not suffer him by such niceties to lose his life. However, upon this doubt, demurrers to indictments are seldom used: since the same advantages may be taken upon a plea of not guilty; or afterwards, in arrest of judgment, when the verdict has established the fact.

III. A plea in *abatement* is principally for a *misnomer*, a wrong name, or a false addition to the prisoner. As, if James Allen, gentleman, is indicted by the name of *John Allen, esquire*, he may plead that he has the name of *James*, and not of *John*; and that he is a *gentleman*, and not an *esquire*. And, if either fact is found by a jury, then the indictment shall be abated, as writs or declarations may be in civil actions. But, in the end, there is little advantage accruing to the prisoner by means of these dilatory pleas; because, if the exception be allowed, a new bill of indictment may be framed, according to what the prisoner in his plea avers to be his true name and addition. For it is a rule, upon all pleas in abatement, that he who takes advantage of a flaw,

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must at the same time show how it may be amended. Let us, therefore, next consider a more substantial kind of plea, &c.

IV. Special pleas in *bar*; which go to the merits of the indictment, and give a reason why the prisoner ought not to answer it at all, nor put himself upon his trial for the crime alleged. These are of four kinds: a former acquittal, a former conviction, a former attainder, or a pardon. There are many other pleas which may be pleaded in bar of an appeal: but these are applicable to both appeals and indictments.

1. First, the plea of *auterfoits acquit*, or a former acquittal, is grounded on this universal maxim of the common law of England, that no man is to be brought into jeopardy of his life, more than once, for the same offence. And hence it is allowed as a consequence, that when a man is once fairly found not guilty upon any indictment, or other prosecution, before any court having competent jurisdiction of the offence, he may plead such acquittal in bar of any subsequent accusation for the same crime.

2. Secondly, the plea of *auterfoits convict*, or a former conviction for the same identical crime, though no judgment was ever given, or perhaps will be (being suspended by the benefit of clergy or other causes), is a good plea in bar to an indictment. And this depends upon the same principle as the former, that no man ought to be twice brought in danger of his life for one and the same crime.

3. Thirdly, the plea of *auterfoits attaint*, or a former attainder, is a good plea in bar, whether it be for the same or any other felony. For wherever a man is attainted of felony, by judgment of death either upon a verdict or confession, by outlawry, or heretofore by abjuration, and whether upon an appeal or an indictment; he may plead such attainder in bar to any subsequent indictment or appeal, for the same or for any other felony. And this because, generally, such proceeding on a second prosecution cannot be to any purpose; for the prisoner is dead in law by the first attainder, his blood is already corrupted, and he hath forfeited all that he had: so that it is absurd and superfluous to endeavour to attaint him a second time. Though to this general rule, as to all others, there are some exceptions; wherein, *cessante ratione, cessat et ipsa lex*.

4. Lastly, a pardon may be pleaded in bar; as at once destroying the end and purpose of the indictment, by remitting that punishment, which the prosecution is calculated to inflict. There is one advantage that attends pleading a pardon in bar, or in the arrest of judgment before sentence is past; which gives it by much the preference to pleading it after sentence or attainder. This is, that by stopping the judgment it stops the attainder, and prevents the corruption of the blood: which, when once corrupted by attainder, cannot afterwards be restored otherwise than by act of parliament.

V. The *general issue*, or plea of not guilty, upon which plea alone the prisoner can receive his final judgment of death. In case of an indictment of felony or treason, there can be no special justification put in by way of plea. As, on an indictment for murder, a man cannot plead that it was in his own defence against a robber on the highway, or a burglar; but he must plead the general issue, Not guilty, and give this special matter in evidence. For (besides that these pleas do in effect amount to the general issue; since, if true, the prisoner is most clearly not guilty) as the facts in treason are laid to be done *proditoriè et contra ligeantiæ suæ debitum*; and, in felony, that the killing was done *felonicè*: these charges, of a traiterous or felonious intent, are the points and very *gist* of the indictment, and must be answered directly, by the general negative, Not guilty; and the jury upon the evidence will take notice of any defensive matter, and give their verdict accordingly as effectually as if it were or could be specially pleaded. So that this is, upon all accounts, the most advantageous plea for the prisoner.

When the prisoner hath thus pleaded not guilty, *non culpabilis*, or *nient culpable*: which was formerly used to be abbreviated upon the minutes, thus, *Non* (or *nient*) *cul.* the clerk of the assize, or clerk of arraigns, on behalf of the crown, replies, that the prisoner is guilty, and that he is ready to prove him so. This is done by two monosyllables in the same spirit of abbreviation, (*cul. prit.*): which signifies first that the prisoner is guilty, (*cul. culpable*, or *culpabilis*); and then that the king is ready to prove him so, (*prit, præsto sum*, or *paratus, verificare*). By this replication the king and the prisoner are therefore at issue: for when the parties come to a fact which is affirmed on one side and denied on the other, then they are said to be at issue in point of fact: which is evidently the case here, in the plea of *non cul.* by the prisoner; and the replication of *cul.* by the clerk.

How the courts came to express a matter of this importance in so odd and obscure a manner, can hardly be pronounced with certainty. It may perhaps, however, be accounted for by supposing, that these were at first short notes, to help the memory of the clerk, and remind him what he was to reply; or else it was the short method of taking down in court, upon the minutes, the replication and averment; *cul. prit.*: which afterwards the ignorance of succeeding clerks adopted for the very words to be by them spoken (A).

But however it may have arisen, the joining of issue seems to be clearly the meaning of this obscure expression; which has puzzled our most ingenious etymologists, and is commonly understood as if the clerk of the arraigns, immediately on plea pleaded, had fixed an opprobrious name on the prisoner, by asking him, "*culprit*, how wilt thou be tried?" for immediately upon issue joined it is inquired of the prisoner, by what trial he will make his innocence appear. This form has at present reference to appeals and approvements only, wherein the appellee has his choice, either to try the accusation by

BATTLE

(A) Of this ignorance we may see daily instances, in the abuse of two legal terms of ancient French: one the prologue to all proclamations, "*Oyez*, or Hear ye," which is generally pronounced, most unmeaningly, "O yes:" the other, a more pardonable mistake, viz. when a jury are all sworn, the officer bids the crier number them, for which the word in law-French is, "*Countez*;" but we now hear it pronounced in very good English, "Count these."

BATTLE or by JURY. But upon indictments, since the abolition of ORDEAL, there can be no other trial but by jury, *per pais*, or by the country: and therefore, if the prisoner refuses to put himself upon the inquest in the usual form, that is, to answer that he will be tried by God and the country, if a commoner; and, if a peer, by God and his peers; the indictment, if in treason, is taken *pro confesso*; and the prisoner, in cases of felony, is judged to stand mute, and, if he perseveres in his obstinacy, shall now be convicted of the felony.

When the prisoner has thus put himself upon his trial, the clerk answers in the humane language of the law, which always hopes that the party's innocence rather than his guilt may appear, "God send thee a good deliverance." And then they proceed, as soon as conveniently may be, to the trial. See the article TRIAL.

PLEADINGS, in *Law*, are the mutual altercations between the plaintiff and defendant, (see SUIT, WRIT, and PROCESS). They form the third part or stage of a fact; and at present are set down and delivered into the proper office in writing, though formerly they were usually put in by their counsel *ore tenus*, or *viva voce*, in court, and then minuted down by the chief clerks or prothonotaries; whence, in our old law-French, the pleadings are frequently denominated the *parol*.

The first of these is the *declaration*, *narratio*, or *count*, anciently called the *tale*; in which the plaintiff sets forth his cause of complaint at length: being indeed only an amplification or exposition of the original writ upon which his action is founded, with the additional circumstances of time and place, when and where, the injury was committed.

In *local* actions, where possession of land is to be recovered, or damages for an actual trespass, or for waste, &c. affecting land, the plaintiff must lay his declaration, or declare his injury to have happened in the very county and place that it really did happen; but in *transitory* actions, for injuries that might have happened anywhere, as debt, detinue, slander, and the like, the plaintiff may declare in what county he pleases, and then the trial must be in that county in which the declaration is laid. Though, if the defendant will make affidavit that the cause of action, if any, arose not in that but another county, the court will direct a change of *the venue* or *visne* (that is, the *vicinia* or neighbourhood in which the injury is declared to be done), and will oblige the plaintiff to declare in the proper county. For the statute 6 Ric. II. c. 2. having ordered all writs to be laid in their proper counties, this, as the judges conceived, impowered them to change the *venue*, if required, and not to insist rigidly on abating the writ: which practice began in the reign of James I. And this power is discretionally exercised, so as not to cause but prevent a defect of justice. Therefore the court will not change the *venue* to any of the four northern counties previous to the spring circuit; because there the assises are holden only once a-year, at the time of summer circuit. And it will sometimes remove the *venue* from the proper jurisdiction (especially of the narrow and limited kind), upon a suggestion, duly supported, that a fair and impartial trial cannot be had therein.

It is generally usual, in actions upon the case, to set forth several cases, by different counts in the same declaration; so that if the plaintiff fails in the proofs of one, he may succeed in another. As in an action on the case upon an ASSUMPSIT for goods sold and delivered, the plaintiff usually counts or declares, first, upon a settled and agreed price between him and the defendant; as, that they bargained for 20l.: and lest he should fail in the proof of this, he counts likewise upon a *quantum valebant*; that the defendant bought other goods, and agreed to pay him so much as they were reasonably worth: and then avers that they were worth other 20l. and so on in three or four different shapes; and at last concludes with declaring, that the defendant had refused to fulfil any of these agreements, whereby he is endamaged to such a value. And if he proves the case laid in any one of his counts, though he fails in the rest, he shall recover proportionable damages. This declaration always concludes with these words, "and thereupon he brings suit," &c. *inde producit sectam*, &c. By which words, *suit* or *secta* (*à sequendo*), were anciently understood the witnesses or followers of the plaintiff. For in former times, the law would not put the defendant to the trouble of answering the charge till the plaintiff had made out at least a probable case. But the actual production of the *suit*, *secta*, or *followers*, is now antiquated, and hath been totally disused, at least ever since the reign of Edward III. though the form of it still continues.

At the end of the declaration are added also the plaintiff's common pledges of prosecution, John Doe and Richard Roe; which, as we elsewhere observe, (see WRIT), are now mere names of form; though formerly they were of use to answer to the king for the amercement of the plaintiff, in case he were nonsuited, barred of his action, or had a verdict and judgment against him. For if the plaintiff neglects to deliver a declaration for two terms after the defendant appears, or is guilty of other delays or defaults against the rules of law in any subsequent stage of the action, he is adjudged not to follow or pursue his remedy as he ought to do; and thereupon a *nonsuit*, or *non prosequitur*, is entered, and he is said to be *non-pros*'d. And for thus deserting his complaint, after making a false claim or complaint (*pro falso clamore suo*), he shall not only pay costs to the defendant, but is liable to be amerced to the king. A *retraxit* differs from a nonsuit, in that the one is negative and the other positive: the nonsuit is a default and neglect of the plaintiff, and therefore he is allowed to begin his suit again upon payment of costs; but a *retraxit* is an open and voluntary renunciation of his suit in court; and by this he for ever loses his action. A *discontinuance* is somewhat similar to a nonsuit; for when a plaintiff leaves a chasm in the proceedings of his cause, as by not continuing the process regularly from day to day, and time to time, as he ought to do, the suit is discontinued, and the defendant is no longer bound to attend; but the plaintiff must begin again, by suing out a new original, usually paying costs to his antagonist.

When the plaintiff hath stated his case in the declaration, it is incumbent on the defendant, within a reasonable time, to make his defence, and put in a plea; or else the plaintiff will at once recover judgment by *default*, or *nihil dicit*, of the defendant.

Defence, in its true legal sense, signifies not a justification, protection, or guard, which is now its popular signification; but merely an *opposing* or *denial* (from the French verb *defendre*) of the truth or validity of the complaint.

Pleadings.

complaint. It is the *conteſtatio litis* of the civilians: a general aſſertion that the plaintiff hath no ground of action; which aſſertion is afterwards extended and maintained in his plea.

Before defence made, if at all, cognizance of the ſuit muſt be claimed or demanded; when any perſon or body-corporate hath the franchiſe, not only of holding pleas within a particular limited juriſdiction, but alſo of the cognizance of pleas; and that either without any words excluſive of other courts, which intitles the lord of the franchiſe, whenever any ſuit that belongs to his juriſdiction is commenced in the courts at Weſtminſter, to demand the cognizance thereof; or with ſuch excluſive words, which alſo intitle the defendant to plead to the juriſdiction of the court. Upon this claim of cognizance, if allowed, all proceedings ſhall ceaſe in the ſuperior court, and the plaintiff is left at liberty to purſue his remedy in the ſpecial juriſdiction. As, when a ſcholar or other privileged perſon of the univerſities of Oxford or Cambridge is impleaded in the courts at Weſtminſter, for any cauſe of action whatſoever, unleſs upon a queſtion of freehold. In theſe caſes, by the charter of thoſe learned bodies, confirmed by act of parliament, the chancellor, or vice-chancellor, may put in a claim of cognizance; which, if made in due time and form, and with due proof of the facts alleged, is regularly allowed by the courts. It muſt be demanded before full defence is made or imparlance prayed; for theſe are a ſubmiſſion to the juriſdiction of the ſuperior court, and the delay is a *laches* in the lord of the franchiſe: and it will not be allowed if it occaſions a failure of juſtice, or if an action be brought againſt the perſon himſelf who claims the franchiſe, unleſs he hath alſo a power in ſuch caſe of making another judge.

After defence made, the defendant muſt put in his plea. But before he defends, if the ſuit is commenced by *capias* or *latitat*, without any ſpecial original, he is intitled to demand one *imparlance*, or *licentia loquendi*; and may, before he pleads, have more granted by conſent of the court, to ſee if he can end the matter amicably without farther ſuit, by talking with the plaintiff: a practice which is ſuppoſed to have ariſen from a principle of religion, in obedience to that precept of the goſpel, "agree with thine adverſary quickly, whilſt thou art *in the way* with him." And it may be obſerved, that this goſpel-precept has a plain reference to the Roman law of the twelve tables, which expreſsly directed the plaintiff and defendant to make up the matter while they were in the way, or going to the prætor;—*in via, rem uti pacent orato.* There are alſo many other previous ſteps which may be taken by a defendant before he puts in his plea. He may, in real actions, demand a view of the thing in queſtion, in order to aſcertain its identity and other circumſtances. He may crave *oyer* of the writ, or of the bond, or other ſpecialty upon which the action is brought; that is, to hear it read to him; the generality of defendants in the times of ancient ſimplicity being ſuppoſed incapable to read it themſelves: whereupon the whole is entered *verbatim* upon the record; and the defendant may take advantage of any condition, or other part of it, not ſtated in the plaintiff's declaration. In real actions alſo the tenant may pray in *aid*, or call for the aſſiſtance of another, to help him to plead, becauſe of the feebleneſs or imbecility of his own eſtate. Thus a tenant for life may pray in aid of him that hath the inheritance in remainder or reverſion; and an incumbent may pray in aid of the patron and ordinary; that is, that they ſhall be joined in the action, and help to defend the title. *Voucher* alſo is the calling in of ſome perſon to anſwer the action, that hath warranted the title to the tenant or defendant. This we ſtill make uſe of in the form of common recoveries, which are grounded on a writ of entry; a ſpecies of action that relies chiefly on the weakneſs of the tenant's title, who therefore vouches another perſon to warrant it. If the voucher appear, he is made defendant inſtead of the voucher; but if he afterwards makes default, recovery ſhall be had againſt the original defendant; and he ſhall recover an equivalent in value againſt the deficient vouchee. In aſſizes, indeed, where the principal queſtion is, whether the demandant or his anceſtors were or were not in poſſeſſion till the ouſter happened, and the title of the tenant is little (if at all) diſcuſſed, there no voucher is allowed; but the tenant may bring a writ of *warrantia chartæ* againſt the warrantor, to compel him to aſſiſt him with a good plea or defence, or elſe to render damages and the value of the land, if recovered againſt the tenant. In many real actions alſo, brought by or againſt an infant under the age of 21 years, and alſo in actions of debt brought againſt him, as heir to any deceaſed anceſtor, either party may ſuggeſt the nonage of the infant, and pray that the proceedings may be deferred till his full age, or, in our legal phraſe, that the infant may have his age, and that the *parol may demur*, that is, that the pleadings may be ſtaid; and then they ſhall not proceed till his full age, unleſs it be apparent that he cannot be prejudiced thereby. But by the ſtatutes of Weſtm. 1. 3 Edw. I. c. 46. and of Gloceſter, 6 Edw. I. c. 2. in writs of entry, *ſur diſſeiſin* in ſome particular caſes, and in actions auncestrel brought by an infant, the parol ſhall not demur; otherwiſe he might be deforced of his whole property, and even want a maintenance, till he came of age. So likewiſe in a writ of dower the heir ſhall not have his age; for it is neceſſary that the widow's claim be immediately determined, elſe ſhe may want a preſent ſubſiſtence. Nor ſhall an infant patron have it in a *quare impedit*, ſince the law holds it neceſſary and expedient that the church be immediately filled.

Pleadings.

When theſe proceedings are over, the defendant muſt then put in his excuſe or plea. See PLEA.

It is a rule in pleading, that no man be allowed to plead ſpecially ſuch a plea as amounts only to the general iſſue, or a total denial of the charge; but in ſuch caſe he ſhall be driven to plead the general iſſue in terms, whereby the whole queſtion is referred to a jury. But if the defendant, in an aſſize or action of treſpaſs, be deſirous to refer the validity of his title to the court rather than the jury, he may ſtate his title ſpecially; and at the ſame time give colour to the plaintiff, or ſuppoſe him to have an appearance or colour of title, bad indeed in point of law, but of which the jury are not competent judges. As if his own true title is, that he claims by feoffment with livery from A, by force of which he entered on the lands in queſtion, he cannot plead this by itſelf, as it amounts to no more than the general iſſue, *nul tort, nul diſſeiſin*, in aſſize, or *not guilty* in an action of treſpaſs. But he may allege this ſpecially, provided he goes farther, and ſays, that the plaintiff claiming by colour of a prior deed of feoffment, without

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out livery, entered; upon whom he entered; and may then refer himſelf to the judgment of the court which of theſe two titles is the beſt in point of law.

When the plea of the defendant is thus put in, if it does not amount to an iſſue or total contradiction of the declaration, but only evades it, the plaintiff may plead again, and reply to the defendant's plea: Either traverſing it, that is, totally denying it; as if, on an action of debt upon bond, the defendant pleads *ſolvit ad diem*, that he paid the money when due; here the plaintiff in his replication may totally traverſe this plea, by denying that the defendant paid it: Or he may allege new matter in contradiction to the defendant's plea; as when the defendant pleads no award made, the plaintiff may reply, and ſet forth an actual award, and aſſign a breach: Or the replication may confeſs and avoid the plea, by ſome new matter or diſtinction, conſiſtent with the plaintiff's former declaration; as in an action for treſpaſſing upon land whereof the plaintiff is ſeized, if the defendant ſhows a title to the land by deſcent, and that therefore he had a right to enter, and gives colour to the plaintiff, the plaintiff may either traverſe and totally deny the fact of the deſcent; or he may confeſs and avoid it, by replying, that true it is that ſuch deſcent happened, but that ſince the deſcent the defendant himſelf demiſed the lands to the plaintiff for term of life. To the replication the defendant may *rejoin*, or put in an anſwer called a *rejoinder*. The plaintiff may anſwer the rejoinder by a *ſur-rejoinder;* upon which the defendant may *rebut*, and the plaintiff anſwer him by a *ſur-rebutter*. Which pleas, replications, rejoinders, ſur-rejoinders, rebutters, and ſur-rebutters, anſwer to the *exceptio, replicatio, duplicatio, triplicatio*, and *quadruplicatio*, of the Roman laws.

The whole of this proceſs is denominated the *pleading;* in the ſeveral ſtages of which it muſt be carefully obſerved, not to depart or vary from the title or defence which the party has once inſiſted on. For this (which is called a *departure* in pleading) might occaſion endleſs altercation. Therefore the replication muſt ſupport the declaration, and the rejoinder muſt ſupport the plea, without departing out of it. As in the caſe of pleading no award made in conſequence of a bond of arbitration, to which the plaintiff replies, ſetting forth an actual award; now the defendant cannot rejoin that he hath performed this award, for ſuch rejoinder would be an entire departure from his original plea, which alleged that no ſuch award was made: therefore he has now no other choice, but to traverſe the fact of the replication, or elſe to demur upon the law of it.

Again, all duplicity in pleading muſt be avoided. Every plea muſt be ſimple, entire, connected, and confined to one ſingle point: it muſt never be entangled with a variety of diſtinct independent anſwers to the ſame matter; which muſt require as many different replies, and introduce a multitude of iſſues upon one and the ſame diſpute. For this would often embarraſs the jury, and ſometimes the court itſelf, and at all events would greatly enhance the expence of the parties. Yet it frequently is expedient to plead in ſuch a manner as to avoid any implied admiſſion of a fact, which cannot with propriety or ſafety be poſitively affirmed or denied. And this may be done by what is called a *proteſtation;* whereby the party interpoſes an oblique allegation or denial of ſome fact, proteſting (by the gerund, *proteſtando*) that ſuch a matter does or does not exiſt; and at the ſame time avoiding a direct affirmation or denial. Sir Edward Coke hath defined a proteſtation (in the pithy dialect of that age) to be, "an excluſion of a concluſion." For the uſe of it is, to ſave the party from being concluded with reſpect to ſome fact or circumſtance which cannot be directly affirmed or denied without falling into duplicity of pleading; and which yet, if he did not thus enter his proteſt, he might be deemed to have tacitly waved or admitted. Thus, while tenure in villainage ſubſiſted, if a villain had brought an action againſt his lord, and the lord was inclined to try the merits of the demand, and at the ſame time to prevent any concluſion againſt himſelf that he had waved his ſigniory; he could not in this caſe both plead affirmatively that the plaintiff was his villain, and alſo take iſſue upon the demand; for then his plea would have been double, as the former alone would have been a good bar to the action: but he might have alleged the villainage of the plaintiff by way of proteſtation, and then have denied the demand. By this means the future vaſſalage of the plaintiff was ſaved to the defendant, in caſe the iſſue was found in his (the defendant's) favour; for the proteſtation prevented that concluſion which would otherwiſe have reſulted from the reſt of his defence, that he had enfranchiſed the plaintiff, ſince no villain could maintain a civil action againſt his lord. So alſo if a defendant, by way of inducement to the point of his defence, alleges (among other matters) a particular mode of ſeiſin or tenure which the plaintiff is unwilling to admit, and yet deſires to take iſſue on the principal point of the defence, he muſt deny the ſeiſin or tenure by way of proteſtation, and then traverſe the defenſive matter. So, laſtly, if an award be ſet forth by the plaintiff, and he can aſſign a breach in one part of it (viz. the non-payment of a ſum of money), and yet is afraid to admit the performance of the reſt of the award, or to aver in general a non-performance of any part of it, leſt ſomething ſhould appear to have been performed; he may ſave to himſelf any advantage he might hereafter make of the general non-performance, by alleging that by proteſtation, he can plead only the non-payment of the money.

In any ſtage of the pleadings, when either ſide advances or affirms any new matter, he uſually (as was ſaid) avers it to be true; "and this he is ready to verify." On the other hand, when either ſide traverſes or denies the facts pleaded by his antagoniſt, he uſually tenders an *iſſue*, as it is called; the language of which is different according to the party by whom it is tendered: for if the traverſe or denial comes from the defendant, the iſſue is tendered in this manner, "And of this he puts himſelf upon the country," thereby ſubmitting himſelf to the judgment of his peers: but if the traverſe lies upon the plaintiff, he tenders the iſſue or prays the judgment of the peers againſt the defendant in another form; thus, "and this he prays may be inquired of by the country."

But if either ſide (as, for inſtance, the defendant) pleads a ſpecial negative plea, not traverſing or denying any thing that was before alleged, but diſcloſing ſome new negative matter; as where the ſuit is on a bond conditioned to perform an award, and the defendant pleads, negatively, that no award was made; he tenders no iſſue upon this plea, becauſe it does not yet appear

whether

whether the fact will be diſputed, the plaintiff not having yet aſſerted the exiſtence of any award: but when the plaintiff replies, and ſets forth an actual ſpecific award, if then the defendant traverſes the replication, and denies the making of any ſuch award, he then, and not before, tenders an iſſue to the plaintiff. For when in the courſe of pleading they come to a point which is affirmed on one ſide and denied on the other, they are then ſaid to be at iſſue; all their debates being at laſt contracted into a ſingle point, which muſt now be determined either in favour of the plaintiff or of the defendant. See ISSUE.

PLEASING, art of. See POLITENESS.

PLEASURE is a word ſo univerſally underſtood as to need no explanation. Lexicographers, however, who muſt attempt to explain every word, call it "the gratification of the mind or ſenſes." It is directly oppoſite to PAIN, and conſtitutes the whole of poſitive happineſs, as that does of miſery.

The Author of Nature has furniſhed us with many pleaſures, as well as made us liable to many pains; and we are ſuſceptible of both in ſome degree as ſoon as we have life and are endowed with the faculty of ſenſation. A French writer, in a work * which once raiſed high expectations, contends, that a child in the womb of its mother feels neither pleaſure nor pain. "Theſe ſenſations (ſays he) are not innate; they have their origin from without; and it is at the moment of our birth that the ſoul receives the firſt impreſſions; impreſſions ſlight and ſuperficial at the beginning, but which by time and repeated acts leave deeper traces in the ſenſorium, and become more extenſive and more laſting. It is when the child ſends forth its firſt cries that ſenſibility or the faculty of ſenſation is produced, which in a ſhort time gathers ſtrength and ſtability by the impreſſion of exterior objects. Pleaſure and pain not being innate, and being only acquired in the ſame manner as the qualities which we derive from inſtruction, education, and ſociety, it follows that we learn to ſuffer and enjoy as we learn any other ſcience."

This is ſtrange reaſoning and ſtrange language. That ſenſations are not innate is univerſally acknowledged; but it does not therefore follow that the ſoul receives its firſt impreſſions and firſt ſenſations at the moment of birth. The child has life, the power of locomotion, and the ſenſe of touch, long before it is born; and every mother will tell this philoſopher, that an infant unborn exhibits ſymptoms both of pain and of pleaſure. That many of our organs of ſenſe are improved by uſe is incontrovertible; but it is ſo far from being true that our ſenſible pleaſures become more exquiſite by being often repeated, that the direct contrary is experienced of far the greater part of them; and though external objects, by making repeated impreſſions on the ſenſes, certainly leave deeper traces on the memory than an object once perceived can do, it by no means follows that theſe impreſſions become the more delightful the more familiar that they are to us. That we learn to ſuffer and enjoy as we learn any other ſcience, is a moſt extravagant paradox; for it is ſelf-evident that we cannot live without being capable in ſome degree both of ſuffering and enjoyment, though a man may certainly live to old age in profound ignorance of all the ſciences.

The ſame writer aſſures us, indeed, that ſenſation is not neceſſary to human life. "Philoſophers (ſays he) make mention of a man who had loſt every kind of feeling in every member of his body: he was pinched or pricked to no purpoſe. Meanwhile this man made uſe of all his members; he walked without pain, he drank, ate, and ſlept, without perceiving that he did ſo. Senſible neither to pleaſure nor plain, he was a true natural machine."

To the tale of theſe anonymous philoſophers our author gives implicit credit, whilſt he favours us at the ſame inſtant with the following argumentation, which completely proves its falſehood. "It is true that ſenſation is a relative quality, ſuſceptible of increaſe and diminution; that it is not neceſſary to exiſtence; and that one might live without it: but in this caſe he would live as an automaton, without feeling pleaſure or pain; and he would poſſeſs neither idea, nor reflection, nor deſire, nor paſſion, nor will, nor ſentiment; his exiſtence would be merely paſſive, he would live without knowing it, and die without apprehenſion."

But if this man of the philoſophers, whom our author calls an *automaton*, and a *true natural machine*, had neither *idea*, nor *deſire*, nor *paſſion*, nor *will*, nor *ſentiment* (and without ſenſation he certainly could have none of them), what induced him to *walk*, *eat*, or *drink*, or to *ceaſe* from any of theſe operations after they were accidentally begun? The inſtances of the *automata* which played on the flute and at cheſs are not to the purpoſe for which they are adduced; for there is no parallel between them and this natural machine, unleſs the philoſophers wound up their man to eat, drink, walk, or ſit, as Vacanſon and Kempeler wound up their automata to play or ceaſe from playing on the German flute and at cheſs. See ANDROIDES.

Our author having for a while ſported with theſe harmleſs paradoxes, proceeds to put the credulity of his reader to the teſt with others of a very contrary tendency. He inſtitutes an inquiry concerning the ſuperiority, in number and degree, of the pleaſures enjoyed by the different orders of men in ſociety; and labours, not indeed by argument, but by looſe declamation, to propagate the belief that happineſs is very unequally diſtributed. The pleaſures of the rich, he ſays, muſt be more numerous and exquiſite than thoſe of the poor; the nobleman muſt have more enjoyments than the plebeian of equal wealth; and the king, according to him, muſt be the happieſt of all men. He owns, indeed, that although "birth, rank, honours, and dignity, add to happineſs, a man is not to be conſidered as miſerable becauſe he is born in the lower conditions of life. A man may be happy as a mechanic, a merchant, or a labourer, provided he enters into the ſpirit of his profeſſion, and has not imbibed by a miſplaced education thoſe ſentiments which make his condition inſupportable. Happineſs is of eaſy acquiſition in the middling ſtations of life; and though perhaps we are unable to know or to rate exactly the pleaſure which ariſes from contentment and mediocrity, yet happineſs being a kind of aggregate of delights, of riches, and of advantages more or leſs great, every perſon muſt have a ſhare of it; the diviſion is not exactly made, but all other things equal, there will be more in the elevated than in the inferior conditions of ſociety; the enjoyment will be more felt, the means of enjoying more multiplied, and the pleaſures more varied. Birth, rank, fortune, talents, wit, genius,

* Encyclopedie Methodique, Logique, Metaphyſique, et Morale, tom. iv.

genius, and virtue, are then the great sources of happiness: those advantages are so considerable, that we see men contented with any one of them; but their union forms supreme felicity.

"There is so vast a difference, says Voltaire, between a man who has made his fortune and one who has to make it, that they are scarcely to be considered as creatures of the same kind. The same thing may be said of birth, the greatest of all advantages in a large society; of rank, of honours, and of great abilities. How great a difference is made between a person of high birth and a tradesman; between a Newton or Descartes and a simple mathematician? Ten thousand soldiers are killed on the field of battle, and it is scarcely mentioned; but if the general fall, and especially if he be a man of courage and abilities, the court and city are filled with the news of his death, and the mourning is universal.

"Frederick the Great, king of Prussia, felt in a more lively manner than perhaps any other man the value of great talents. I would willingly renounce, said he to Voltaire, every thing which is an object of desire and ambition to man; but I am certain if I were not a prince I should be nothing. Your merit alone would gain you the esteem, and envy, and admiration of the world; but to secure respect for me, titles, and armies, and revenues, are absolutely necessary."

For what purpose this account of human happiness was published, it becomes not us to say. Its obvious tendency is to make the lower orders of society discontented with their state, and envious of their superiors; and it is not unreasonable to suppose, that it contributed in some degree to excite the ignorant part of the author's countrymen to the commission of those atrocities of which they have since been guilty. That such was his intention, the following extract will not permit us to believe; for though in it the author attempts to support the same false theory of human happiness, he mentions virtuous kings with the respect becoming a loyal subject of the unfortunate Louis, whose character he seems to have intentionally drawn, and whose death by the authority of a savage faction he has in effect foretold.

"Happiness, in a state of society, takes the most variable forms: it is a Proteus susceptible of every kind of metamorphosis: it is different in different men, in different ages, and in different conditions, &c. The pleasures of youth are very different from those of old age: what affords enjoyment to a mechanic would be supreme misery to a nobleman: and the amusements of the country would appear insipid in the capital. Is there then nothing fixed with regard to happiness? Is it of all things the most variable and the most arbitrary? Or, in judging of it, is it impossible to find a standard by which we can determine the limits of the greatest good to which man can arrive in the present state? It is evident that men form the same ideas of the beautiful and sublime in nature, and of right and wrong in morality, provided they have arrived at that degree of improvement and civilization of which human nature is susceptible; and that different opinions on these subjects depend on different degrees of culture, of education, and of improvement. The same thing may be advanced with regard to happiness: all men, if equal with respect to their organs, would form the very same ideas on this subject if they reached the degree of improvement of which we are presently speaking; and in fact, do we not see in the great circles at Rome, at Vienna, at London, and at Paris, that those who are called people of fashion, who have received the same education, have nearly the same taste, the same desires, and the same spirit for enjoyment? there is doubtless a certain degree of happiness to be enjoyed in every condition of life; but as there are some conditions preferable to others, so are there degrees of happiness greater and less; and if we were to form an idea of the greatest possible in the present state, it perhaps would be that of a sovereign, master of a great empire, enjoying good health and a moderate spirit; endowed with piety and virtue; whose whole life was employed in acts of justice and mercy, and who governed by fixed and immoveable laws. Such a king is the image of the divinity on earth, and he must be the idol of a wise people. His whole life should present a picture of the most august felicity. Although such sovereigns are rare, yet we are not without examples of them. Ancient history affords us Titus and Marcus Aurelius, and the present age can boast of piety and munificence in the character of some of its kings. This state of the greatest happiness to which man can reach not being ideal, it will serve as a standard of comparison by which happiness and misery can be estimated in all civilized countries. *He is as happy as a king*, is a proverbial expression, because we believe with justice that royalty is the extreme limit of the greatest enjoyments; and in fact, happiness being the work of man, that condition which comprehends all the degrees of power and of glory, which is the source of honour and of dignity, and which supposes in the person invested with it all means of enjoyment either for himself or others, leaves nothing on this earth to which any reasonable man would give the preference.

"We can find also in this high rank the extreme of the greatest evils to which the condition of nature is exposed. A king condemned to death and perishing on a scaffold, by the authority of a faction, while at the same time he had endeavoured by every means in his power to promote the general happiness of his subjects, is the most terrible and striking example of human misery; for if it be true that a crown is the greatest of all blessings, then the loss of it, and at the same time the loss of life by an ignominious and unjust sentence, are of all calamities the most dreadful.

"It is also in the courts of kings that we find the most amiable and perfect characters; and it is there where true grandeur, true politeness, the best tone of manners, the most amiable graces, and the most eminent virtues, are completely established. It is in courts that men seem to have acquired their greatest improvement: Whosoever has seen a court, says La Bruyere, has seen the world in the most beautiful, the most enchanting, and attractive colours. The prejudices of mankind in behalf of the great are so excessive, that if they inclined to be good they would be almost the objects of adoration."

In this passage there are doubtless many just observations; but there is at least an equal number of others both false and dangerous. That a crown is the greatest of earthly blessings, and that it is in the courts of kings that we meet with the most amiable and perfect characters, are positions which a true philosopher will not admit but with great limitations. The falsehood of the author's

author's general theory reſpecting the unequal diſtribution of happineſs in ſociety, we need not waſte time in expoſing. It is ſufficiently expoſed in other articles of this work, and in one of them by a writer of a very ſuperior order (ſee HAPPINESS; and *MORAL Philoſophy*, Part II. chap. ii.). He enters upon other ſpeculations reſpecting the pleaſures and pains of ſavages, which are ingenious and worthy of attention; but before we proceed to notice them, it will be proper to conſider the connection which ſubſiſts between pleaſure and pain.

"That the ceſſation of pain is accompanied by pleaſure, is a fact (ſays a philoſopher of the firſt rank †) which has been repeatedly obſerved, but perhaps not ſufficiently accounted for. Let us ſuppoſe a perſon in a ſtate of indifference as to heat. Upon coming near a fire, he will experience at firſt an agreeable warmth, i. e. pleaſure. If the heat be increaſed, this ſtate of pleaſure will, after a time, be converted into one of pain, from the increaſed action upon the nerves and brain, the undoubted organs of all bodily ſenſations. Let the heat now be gradually withdrawn, the nervous ſyſtem muſt acquire again, during this removal, the ſtate of agreeable warmth or pleaſure; and after paſſing through that ſtate it will arrive at indifference. From this fact then we may conclude, that a ſtate of pleaſure may be puſhed on till it is converted into one of pain; and, on the other hand, that an action which produces pain will, if it go off gradually, induce at a certain period of its decreaſe a ſtate of pleaſure. The ſame reaſoning which has thus been applied to the body may be extended alſo to the mind. Total languor of mind is not ſo pleaſant as a certain degree of action or emotion; and emotions pleaſant at one period may be increaſed till they become painful at another; whilſt painful emotions, as they gradually expire, will, at a certain period of their decreaſe, induce a ſtate of pleaſure. Hence then we are able to explain why pleaſure ſhould ariſe in all caſes from the gradual ceſſation of any action or emotion which produces pain."

† Dr Sayers.

The ſame author maintains, that from the mere removal of pain, whether by degrees or inſtantaneouſly, we always experience pleaſure; and if the pain removed was exquiſite, what he maintains is certainly true. To account for this phenomenon he lays down the following law of nature, which experience abundantly confirms, viz. "that the temporary withdrawing of any action from the body or mind invariably renders them more ſuſceptible of that action when again produced." Thus, after long faſting, the body is more ſuſceptible of the effects of food than if the ſtomach had been lately ſatisfied; the action of ſtrong liquors is found to be greater on thoſe who uſe them ſeldom than on ſuch as are in the habit of drinking them. Thus, too, with reſpect to the mind; if a perſon be deprived for a time of his friend's ſociety, or of a favourite amuſement, the next viſit of his friend, or the next renewal of his amuſement, is attended with much more pleaſure than if they had never been withheld from him.

"To apply this law to the caſe of a perſon ſuddenly relieved from acute pain. While he labours with ſuch pain, his mind is ſo totally occupied by it, that he is unable to attend to his cuſtomary purſuits or amuſements. He becomes therefore ſo much more ſuſceptible of their action, that when they are again preſented to him, he is raiſed above his uſual indifference to poſitive pleaſure. But all pains do not proceed from an exceſs of action. Many of them ariſe from reducing the body or the mind to a ſtate below indifference. Thus, if a perſon have juſt ſufficient warmth in his body to keep him barely at eaſe or in a ſtate of indifference, by withdrawing this heat, a ſtate of uneaſineſs or pain is produced; and if in a calm ſtate of mind one be made acquainted with a melancholy event, his quiet is interrupted, and he ſinks below indifference into a painful ſtate of mind. If now, without communicating any new ſource of poſitive pleaſure, we remove in the former caſe the cold, and in the latter the grief, the perſons from whom they are removed will experience real pleaſure. Thus, then, whether pain ariſes from exceſs or deficiency of action, the gradual or the ſudden removal of it muſt be in all caſes attended with pleaſure *." It is equally true that the gradual or ſudden removal of pleaſure is attended with pain.

* Diſquiſitions Metaphyſical and Literary.

We are now prepared to examine our French author's account of the pleaſures and pains of ſavages. "Every age (ſays he) has its different pleaſures; but if we were to imagine that thoſe of childhood are equal to thoſe of confirmed age, we ſhould be much miſtaken in our eſtimation of happineſs. The pleaſures of philoſophy, either natural or moral, are not unfolded to the infant; the moſt perfect muſic is a vain noiſe; the moſt exquiſite perfumes and diſhes highly ſeaſoned offend his young organs inſtead of affording delight; his touch is imperfect; forty days elapſe before the child gives any ſign of laughter or of weeping; his cries and groans before that period are not accompanied with tears; his countenance expreſſes no paſſion; the parts of his face bear no relation to the ſentiments of the ſoul, and are moreover without conſiſtency. Children are but little affected with cold; whether it be that they feel leſs, or that the interior heat is greater than in adults. In them all the impreſſions of pleaſure and pain are tranſitory; their memory has ſcarcely begun to unfold its powers; they enjoy nothing but the preſent moment; they weep, laugh, and give tones of ſatisfaction without conſciouſneſs, or at leaſt without reflection; their joy is confined to the indulgence of their little whims, and conſtraint is the greateſt of their misfortunes; few things amuſe, and nothing ſatisfies them. In this happy condition of early infancy nature is at the whole expence of happineſs; and the only point is not to contradict her. What deſires have children? Give them liberty in all their movements, and they have a plenitude of exiſtence, an abundance of that kind of happineſs which is confined in ſome ſort to all the objects which ſurround them: but if all beings were happy on the ſame conditions, ſociety would be at no expence in procuring the happineſs of the different individuals who compoſe it. Senſation is the foundation of reflection; it is the principal attribute of the ſoul; it is by this that man is elevated to ſublime ſpeculations, and ſecures his dominion over nature and himſelf. This quality is not ſtationary, but ſuſceptible, like all other relative qualities, of increaſe and decay, of different degrees of ſtrength and intenſeneſs: it is different in different men; and in the ſame man it increaſes from infancy to youth, from youth to confirmed manhood: at this period it ſtops, and gradually declines as we proceed to old age and to ſecond childiſhneſs. Conſidered phyſically, it varies according to age, conſtitution, climate, and food; conſidered in a moral point of

Pleasure.

of view, it takes its different appearances from individual education, and from the habits of society; for man in a state of nature and society, with regard to sensation and the unfolding of his powers, may be considered as two distinct beings: and if one were to make a calculation of pleasure in the course of human life, a man of fortune and capacity enjoys more than ten thousand savages.

"Pleasure and pain being relative qualities, they may be almost annihilated in the moment of vehement passion. In the heat of battle, for example, ardent and animated spirits have not felt the pain of their wounds; and minds strongly penetrated with sentiments of religion, enthusiasm, and humanity, have supported the most cruel torments with courage and fortitude. The sensibility of some persons is so exquisitely alive, that one can scarcely approach them without throwing them into convulsions. Many diseases show the effect of sensibility pushed to an extreme; such as hysteric affections, certain kinds of madness, and some of those which proceed from poison, and from the bite or sting of certain animals, as the viper and the tarantula. Excessive joy or grief, fear and terror, have been known to destroy all sensation, and occasion death (A)."

Having made these preliminary observations on pleasure and pain in infancy, and as they are increased or diminished by education, and the different conditions of body and mind, our author proceeds to consider the capability of savages to feel pleasure and pain. "By savages he understands all the tribes of men who live by hunting and fishing, and on those things which the earth yields without cultivation. Those tribes who possess herds of cattle, and who derive their subsistence from such possessions, are not to be considered as savages, as they have some idea of property. Some savages are naturally compassionate and humane, others are cruel and sanguinary. Although the physical constitution of man be everywhere the same, yet the varieties of climate, the abundance or scarcity of natural productions, have a powerful influence to determine the inclinations; even the fierceness of the tiger is softened under a mild sky. Now nature forms the manners of savages just as society and civil institutions form the manners of civilized life. In the one case climate and food produce almost the whole effect; in the other they have scarcely any influence. The habits of society every moment contend with nature, and they are almost always victorious. The savage devotes himself to the dominion of his passions; the civilized man is employed in restraining, in directing, and in modifying them: so much influence have government, laws, society, and the fear of censure and punishment, over his soul.

"It is not to be doubted that savages are susceptible both of pleasure and pain; but are the impressions made on their organs as sensible, or do they feel pain in the same degree with the inhabitants of a civilized country?

"Their enjoyments are so limited, that if we confine ourselves to truth, a few lines will be sufficient to describe them: our attention must therefore be confined to pain, because the manner in which they support misfortune, and even torture, presents us with a view of character unequalled in the history of civilized nations. It is not uncommon in civilized countries to see men braving death, meeting it with cheerfulness, and even not uttering complaints under the torture; but they do not insult the executioners of public vengeance, and defy pain in order to augment their torments; and those who are condemned by the laws suffer the punishment with different degrees of fortitude. On those mournful occasions, the common ranks of mankind in general die with less firmness: those, on the other hand, who have received education, and who, by a train of unfortunate events are brought to the scaffold, whether it be the fear of being reproached with cowardice, or the consideration that the stroke is inevitable, such men discover the expiring sighs of self-love even in their last moments; and those especially of high rank, from their manners and sentiments, are expected to meet death with magnanimity: but an American savage in the moment of punishment appears to be more than human; he is a hero of the first order, who braves his tormentors, who provokes them to employ all their art, and who considers as his chief glory to bear the greatest degree of pain without shrinking (see AMERICA, N° 14, 27, 28, 29.). The recital of their tortures would appear exaggerated, if it were not attested by the best authority, and if the savage nations among whom those customs are established were not sufficiently known; but the excess of the cruelty is not so astonishing as the courage of the victim. The European exposed to sufferings of the same dreadful nature would rend heaven and earth with his piercing cries and horrible groans; the reward of martyrdom, the prospect of eternal life, could alone give him fortitude to endure such torments; but the savage is not animated with this exalted hope. What supports him then in scenes of so exquisite suffering? The feeling of shame, the fear of bringing reproach on his tribe, and giving a stain to his fellows never to be wiped away, are the only sentiments which influence the mind of a savage, and which always present to his imagination, animate him, support him, and lend him spirit and resolution. At the same time, however powerful those motives may be, they would not be alone sufficient, if the

(A) There are instances of persons who have died at the noise of thunder without being touched. A man frightened with the fall of a gallery in which he happened to be, was immediately seized with the black jaundice. M. le Cat mentions a young person on whom the insolence of another made such an impression, that his countenance became at first yellow, and then changed into black, in such a manner that in less than eight days he appeared to wear a mask of black velvet: he continued in this state for four months, without any other symptom of bad health or any pain. A sailor was so terrified in a storm, that his face sweated blood, which like ordinary sweat returned as it was wiped off. Stahl, whose testimony cannot be called in question, cites a similar case of a girl who had been frightened with soldiers. The excess of fear, according to many physicians, produces madness and epilepsy.

Pleaſure.

the ſavage felt pain in the ſame degree with the European. Senſibility, as we have already obſerved, is increaſed by education ; it is influenced by ſociety, manners, laws, and government ; climate and food work it into a hundred different ſhapes ; and all the phyſical and moral cauſes contribute to increaſe and diminiſh it. The habitual exiſtence of a ſavage would be a ſtate of ſuffering to an inhabitant of Europe. You muſt cut the fleſh of the one and tear it away with your nails, before you can make him feel in an equal degree to a ſcratch or prick of a needle in the other. The ſavage, doubtleſs, ſuffers under torture, but he ſuffers much leſs than an European in the ſame circumſtances : the reaſon is obvious ; the air which the ſavages breathe is loaded with fog and moiſt vapours ; their rivers not being confined by high banks, are by the winds as well as in floods ſpread over the level fields, and depoſit on them a putrid and pernicious ſlime ; the trees ſqueezed one upon another, in that rude and uncultivated country ſerve rather as a covering to the earth than an ornament. Inſtead of thoſe freſh and delicious ſhades, thoſe openings in the woods, and walks croſſing each other in all directions, which delight the traveller in the fine foreſts of France and Germany ; thoſe in America ſerve only to intercept the rays of the ſun, and to prevent the benign influence of his beams. The ſavage participates of this cold humidity ; his blood has little heat, his humours are groſs, and his conſtitution phlegmatic. To the powerful influence of climate, it is neceſſary to join the habits of his life. Obliged to traverſe vaſt deſerts for ſubſiſtence, his body is accuſtomed to fatigue ; food not nouriſhing, and at the ſame time in no great plenty, blunts his feelings ; and all the hardſhips of the ſavage ſtate give a rigidity to his members which makes him almoſt incapable of ſuffering. The ſavage in this ſtate of nature may be compared to our water-women and ſtreet-porters, who, though they poſſeſs neither great vigour nor ſtrength, are capable of performing daily, and without complaint, that kind of labour which to a man in a different condition of life would be a painful and grievous burden. Feeling, in leſs perfection with the ſavage, by the effects of climate and food, and the habits of his life, is ſtill farther reſtrained by moral conſiderations. The European is leſs a man of nature than of ſociety : moral reſtraints are powerful with him ; while over the American they have ſcarcely any influence. This latter then is in a double condition of imperfection with regard to us ; his ſenſes are blunted, and his moral powers are not diſcloſed. Now, pleaſure, and pain depending on the perfection of the ſenſes and the unfolding of the intellectual faculties, it cannot be doubted, that in enjoyments of any kind ſavages experience leſs pleaſure, and in their ſuffering leſs pain, than Europeans in the ſame circumſtances. And in fact, the ſavages of America poſſeſs a very feeble conſtitution. They are agile without being ſtrong ; and this agility depends more on their habits than on the perfection of their members : they owe it to the neceſſity of hunting ; and they are moreover ſo weak, that they were unable to bear the toil which their firſt oppreſſors impoſed on them. Hence a race of men in all reſpects ſo imperfect could not endure torment under which the moſt robuſt European would ſink, if the pain which they feel were really as great as it appears to be. Feeling is then, and muſt neceſſarily be, leſs in the ſavage condition ; for this faculty diſcloſing itſelf by the exerciſe of all the phyſical and moral qualities, muſt be leſs as they are leſs exerciſed. Every thing ſhows the imperfection of this precious quality, this ſource of all our affections, in the American ſavages.

"All the improvements in Europe have had a tendency to unfold ſenſibility : the air is purified that we may breathe more freely ; the moraſſes are drained, the rivers are regulated in their courſes, the food is nouriſhing, and the houſes commodious. With the ſavages, on the contrary, every thing tends to curb it ; they take pleaſure even in hardening the organs of the body, in accuſtoming themſelves to bear by degrees the moſt acute pain without complaining. Boys and girls among the ſavages amuſe themſelves with tying their naked arms together, and laying a kindled coal between them, to try which of them can longeſt ſuffer the heat ; and the warriors who aſpire to the honour of being chief, undergo a courſe of ſuffering which exceeds the idea of torture inflicted on the greateſt criminals in Europe."

Theſe obſervations on the pleaſures and pains of ſavages appear to be well-founded, and, as the attentive reader will perceive, are perfectly agreeable to the theory of Dr Sayers. If indeed that theory be juſt, as we believe it to be, it will follow, that the few pleaſures of ſenſe which the American enjoys, he ought to enjoy more completely than any European, becauſe to him they recur but ſeldom. This may very poſſibly be the caſe ; and certainly would be ſo, were not his fibres, by climate and the habits of his life, rendered more rigid than thoſe of the civilized part of the inhabitants of Europe. But if we agree with our author * in what he ſays of the pains and pleaſures of ſavages, we cannot admit, without many exceptions, his theory of the enjoyments of children. It is ſo far from being true, that few things amuſe, and that nothing ſatisfies them, that the direct contrary muſt have been obſerved by every man attentive to the operations of the infant mind, which is amuſed with every thing new, and often completely ſatisfied with the mereſt trifle. The pleaſures of philoſophy are not indeed unfolded to the infant ; but it by no means follows that he does not enjoy his rattle and his drum as much as the philoſopher enjoys his teleſcope and air-pump ; and if there be any truth in the ſcience of phyſiognomy, the happineſs of the former is much more pure and exquiſite than that of the latter. That the moſt perfect muſic is vain noiſe to an infant, is far from being ſelf-evident, unleſs the author confines the ſtate of infancy to a very few months ; and we are not diſpoſed to believe, without better proof than we have yet received, that the reliſh of exquiſite perfumes and highly-ſeaſoned diſhes adds much to the ſum of human felicity.

* *Encyclopedie Methodique, Logique, Metaphyſique, et Morale,* tom. iv.

But however much we diſapprove of many of theſe reflections, the following we cordially adopt as our own. "If we compare (ſays our author) the pleaſures of ſenſe with thoſe which are purely intellectual, we ſhall find that the latter are infinitely ſuperior to the former, as they may be enjoyed at all times and in every ſituation of life. What are the pleaſures of the table, ſays Cicero, of gaming, and of women, compared with the delight of ſtudy ? This taſte increaſes with age, and no happineſs

Pleasure.

happiness is equal to it. Without knowledge and study, says Cato, life is almost the image of death (B). The pleasures of the soul are such, that it is frequent enough to see men preserve their gaiety during their whole life, notwithstanding a weak, diseased, and debilitated body. Scaron, who lived in the last century, was an example of this. Balzac, speaking of him, says, that Prometheus, Hercules, and Philoctetes, in profane, and Job in sacred, history, said many great things while they were afflicted with violent pain; but Scaron alone said pleasant things. I have seen, continues he, in many places of ancient history, constancy, and modesty, and wisdom, and eloquence, accompanying affliction; but he is the only instance wherein I have seen pleasantry.

"There are men whose understandings are constantly on the stretch, and by this very means they are improved; but if the body were as constantly employed in the pursuit of sensual gratification, the constitution would soon be destroyed. The more we employ the mind we are capable of the greater exertion; but the more we employ the body we require the greater repose. There are besides but some parts of the body capable of enjoying pleasure; every part of it can experience pain. A toothach occasions more suffering than the most considerable of our pleasures can procure of enjoyment. Great pain may continue for any length of time; excessive pleasures are almost momentary. Pleasure carried to an extreme becomes painful; but pain, either by augmenting or diminishing it, never becomes agreeable. For the moment, the pleasures of the senses are perhaps more satisfactory; but in point of duration those of the heart and mind are infinitely preferable. All the sentiments of tenderness, of friendship, of gratitude, and of generosity, are sources of enjoyment for man in a state of civilization. The damned are exceedingly unhappy, said St Catherine de Sienna, if they are incapable of loving or being beloved.

"Pleasure, continued for a great length of time, produces languor and fatigue, and excites sleep; the continuation of pain is productive of none of these effects. Many suffer pain for eight days and even a month without interruption; an equal duration of excessive pleasure would occasion death.

"Time is a mere relative idea with regard to pleasure and pain; it appears long when we suffer, and short when we enjoy. If there existed no regular and uniform movement in nature, we would not be able from our sensations alone to measure time with any degree of exactness, for pain lengthens and pleasure abridges it. From the languor of unoccupied time has arisen the proverb expressive of our desire to *kill* it. It is a melancholy reflection, and at the same time true, that there is no enjoyment which can effectually secure us from pain for the remainder of our lives; while there are examples of evils which hold men in constant sorrow and pain during their whole existence. Such then is the imperfection of the one and the power of the other.

Pleasure.

"Pleasure and pain are the sources of morality; an action is just or unjust, good or otherwise, only as its natural tendency is to produce suffering or enjoyment to mankind. No crime could be committed against a being altogether insensible, nor could any good be bestowed on it. Unless he were endowed with the desire of pleasure and the apprehension of pain, man, like an automaton, would act from necessity, without choice and without determination.

"All our passions are the developement of sensibility. If we were not possessed of feeling, we should be destitute of passions; and as sensibility is augmented by civilization, the passions are multiplied; more active and vigorous in an extensive and civilized empire than in a small state; more in the latter than among barbarous nations; and more in these last than among savages (see Passion). There are more passions in France and England than in all the nations of Europe; because every thing which serves to excite and foster them is always in those countries in the greatest state of fermentation. The mind is active; the ideas great, extensive, and multiplied. And is it not the soul, the mind, and heart, which are the focus of all the passions?"

But wherever the passions are multiplied, the sources of pleasure and pain are multiplied with them. This being the case, it is impossible to prescribe a fixed and general rule of happiness suited to every individual. There are objects of pleasure with regard to which all men of a certain education are agreed; but there are perhaps many more, owing to the variety of tempers and education, about which they differ. Every man forms ideas of enjoyment relative to his character; and what pleases one may be utterly detested by another. In proportion as a nation is civilized and extensive, those differences are remarkable. Savages, who are not acquainted with all the variety of European pleasures, amuse themselves with very few objects. Owing to the want of civilization, they have scarcely any choice in the objects of taste. They have few passions; we have many. But even in the nations of Europe pleasure is infinitely varied in its modification and forms. Those differences arise from manners, from governments, from political and religious customs, and chiefly from education. Meanwhile, however different and variable the ideas of pleasure may be among nations and individuals, it still remains a fact, that a certain number of persons in all civilized states, whether distinguished by birth, or rank, or fortune, or talents, as they have nearly the same education so they form nearly the same ideas of happiness: but to possess it a man must give his chief application to the state of his mind; and notwithstanding all his efforts it is of uncertain duration. Happiness is the sunshine of life: we enjoy it frequently at great intervals; and it is therefore necessary to know how to use

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(B) "Savages, barbarians, and peasants, enjoy little happiness except that of sensation. The happiness of a civilized and well-informed man consists of sensations, of ideas, and of a great number of affinities, altogether unknown to them. He not only enjoys the present, but the past and the future. He recals the agreeable idea of pleasures which he has tasted. It is great happiness, says an ancient, to have the recollection of good actions, of an upright intention, and of promises which we have kept."

ufe it. All the productions of art perifh; the largeft fortunes are diffipated; rank, honour, and dignity, pafs away like a fleeting fhadow; the memory is impaired; all the faculties of the foul are extinguifhed; the body finks under the infirmities of old age; and fcarcely has one reached the boundaries of happinefs marked out by his imagination, when he muft give place to another, and renounce all his pleafures, all his hopes, all his illufions; the fugitive images of which had given happinefs to the mind.

There are pleafures, however, on which the mind may fecurely reft, which elevate man above himfelf, dignify his nature, fix his attention on fpiritual things, and render him worthy of the care of Providence. Thefe are to be found in true religion; which procures for thofe who practife its duties inexpreffible happinefs in a better country, and is in this world the fupport of the weak, and the fweet confolation of the unfortunate.

PLEBEIAN, any perfon of the rank of the common people. It is chiefly ufed in fpeaking of the ancient Romans, who were divided into fenators, patricians, and plebeians. The diftinction was made by Romulus the founder of the city; who confined all dignities, civil, military, and facerdotal, to the rank of patricians. But to prevent the feditions which fuch a diftinction might produce through the pride of the higher order and the envy of the lower, he endeavoured to engage them to one another by reciprocal ties and obligations. Every plebeian was allowed to choofe, out of the body of the patricians, a protector, who fhould be obliged to affift him with his intereft and fubftance, and to defend him from oppreffion. Thefe protectors were called *patrons;* the protected, *clients*. It was the duty of the patron to draw up the contracts of the clients, to extricate them out of their difficulties and perplexities, and to guard their ignorance againft the artfulnefs of the crafty. On the other hand, if the patron was poor, his clients were obliged to contribute to the portions of his daughters, the payment of his debts, and the ranfom of him and his children if they happened to be taken in war. The client and patron could neither accufe nor bear witnefs againft each other; and if either of them was convicted of having violated this law, the crime was equal to that of treafon, and any one might with impunity flay the offender as a victim devoted to Pluto and the infernal gods. For more than 600 years we find no diffenfions or jealoufies between the patrons and their clients; not even in the times of the republic, when the people frequently mutinied againft the great and powerful.

PLECTRANTHUS, a genus of plants belonging to the didynamia clafs; and in the natural method ranking under the 42d order, *Verticillatæ*. See BOTANY *Index*.

PLEDGE (*Plegius*), in common law, a furety or gage, either real or perfonal, which the plaintiff or demandant is to find for his profecuting the fuit.

The word is fometimes alfo ufed for *FRANK Pledge*, which fee.

To PLEDGE, in drinking, denotes to warrant, or be furety to one, that he fhall receive no harm while he is taking his draught. The phrafe is referred by antiquaries to the practice of the Danes heretofore in England, who frequently ufed to ftab or cut the throats of the natives while they were drinking.

PLEDGES of Goods for money. See PAWN.

PLEDGERY, or PLEGGERY, in *Law*, furetifhip, or an undertaking or anfwering for another.

PLEDGET, BOLSTER, or *Comprefs*, in *Surgery*, a kind of flat tent laid over a wound, to imbibe the fuperfluous humours, and to keep it clean.

PLEIADES, in fabulous hiftory, the feven daughters of Atlas king of Mauritania and Pleione, were thus called from their mother. They were Maia, Electra, Taygete, Afterope, Merope, Halcyone, and Celœno; and were alfo called *Atlantides*, from their father Atlas. Thefe princeffes were carried off by Bufiris king of Egypt; but Hercules having conquered him, delivered them to their father: yet they afterwards fuffered a new perfecution from Orion, who purfued them five years, till Jove, being prevailed on by their prayers, took them up into the heavens, where they form the conftellation which bears their name.

PLEIADES, in *Aftronomy*, an affemblage of feven ftars, in the neck of the conftellation Taurus.

They are thus called from the Greek πλειν, *navigare*, "to fail;" as being terrible to mariners, by reafon of the rains and ftorms that frequently rife with them. The Latins called them *vergiliæ*, from *ver*, "fpring;" becaufe of their rifing about the time of the vernal equinox. The largeft is of the third magnitude, and is called *lucida pleiadum*.

PLENARY, fomething complete or full. Thus we fay the pope grants *plenary* indulgences; i. e. full and entire remiffions of the penalties due to all fins. See INDULGENCES.

PLENIPOTENTIARY, a perfon vefted with full power to do any thing. See AMBASSADOR.

PLENITUDE, the quality of a thing that is full, or that fills another. In medicine, it chiefly denotes a redundancy of blood and humours.

PLENUM, in *Phyfics*, denotes, according to the Cartefians, that ftate of things wherein every part of fpace is fuppofed to be full of matter, in oppofition to a VACUUM, which is a fpace fuppofed devoid of all matter.

PLENUS FLOS, a full flower; a term expreffive of the higheft degree of luxuriance in flowers. See BOTANY. Such flowers, although the moft delightful to the eye, are both vegetable monfters, and, according to the fexualifts, vegetable eunuchs; the unnatural increafe of the petals conftituting the firft; the confequent exclufion of the ftamina or male organs, the latter. The following are well-known examples of flowers with more petals than one; ranunculus, anemone, marfhmarygold, columbine, fennel-flower, poppy, pæony, pink, gilliflower, campion, vifcous campion, lily, crown imperial, tulip, narciffus, rocket, mallow, Syrian mallow, apple, pear, peach, cherry, almond, myrtle, rofe, and ftrawberry.

Flowers with one petal are not fo fubject to fullnefs. The following, however, are inftances: polyanthus, hyacinth, primrofe, crocus, meadow-faffron, and thornapple; though Kramer has afferted that a full flower with one petal is a contradiction in terms. In flowers with one petal, the mode of luxuriance, or impletion, is by a multiplication of the divifions of the limb or upper part; in flowers with more petals than one, by a multiplication of the petals or nectarium.

To take a few examples. Columbine is rendered full in

in three different ways: by the multiplication of its petals, and total exclusion of the nectaria; 2. By the multiplication of the nectaria, and exclusion of the petals; or, 3. By such an increase of the nectaria only as does not exclude the petals, between each of which are interjected three nectaria, placed one within another. Again, fennel-flower is rendered full by an increase of the nectaria only; narcissus, either by a multiplication of its cup and petals, or of its cup only; larkspur commonly by an increase of the petals and exclusion of the spur, which is its nectarium. In *saponaria concava anglia* the impletion is attended with the singular effect of incorporating the petals, and reducing their number from five to one; and in gelder-rose, the luxuriance is effected by an increase both in magnitude and number of the circumference or margin of the head of flowers, in the plain, wheel-shaped, barren florets; and an exclusion of all the bell-shaped hermaphrodite florets of the centre or disk.

Hitherto we have treated of plenitude in simple flowers only: the instance just now adduced seems to connect the different modes of impletion in them and compound flowers. Before proceeding farther, however, it will not be improper to premise, that as a simple luxuriant flower is frequently, by beginners, mistaken for a compound flower in a natural state, such flowers may always be distinguished with certainty by this rule: That in simple flowers, however luxuriant, there is but one pistillum or female organ; whereas in compound flowers, each floret, or partial flower, is furnished with its own proper pistillum. Thus in hawk-weed, a compound flower, each flat or tongue-shaped floret in the aggregate has its five stamina and naked seed, which last is in effect its pistillum; whereas, in a luxuriant lychnis, which is a simple flower, there is found only one pistillum or female organ common to the whole.

In a compound radiated flower, which generally consists of plain florets in the margin or radius, and tubular or hollow florets in the centre or disc, plenitude is effected either by an increase of the florets in the margin, and a total exclusion of those in the disc; which mode of luxuriance is termed *impletion by the radius*, and resembles what happens in the gelder-rose: or by an elongation of the hollow florets in the centre, and a less profound division of their brims; which is termed *impletion of the disc*. In the first mode of luxuriance, the florets in the centre, which are always hermaphrodite or male, are entirely excluded; and in their place succeed florets similar in sex to those of the radius. Now as the florets in the margin of a radiated compound flower are found to be always either female, that is, furnished with the pistillum only; or neuter, that is, furnished with neither stamina nor pistillum; it is evident, that a radiated compound flower, filled by the radius, will either be entirely female, as in feverfew, daisy, and African marigold; or entirely neuter, as in sun-flower, marygold, and centaury: hence it will always be easy to distinguish such a luxuriant flower from a compound flower with plain florets in a natural state; as these flowers are all hermaphrodite, that is, furnished with both stamina and pistillum. Thus the full flowers of African marigold have each floret furnished with the pistillum or female organ only: the natural flowers of dandelion, which, like the former, is composed of plain florets, are furnished with both stamina and pistillum.

In the second mode of luxuriance, termed *impletion by the disc*, the florets in the margin sometimes remain unchanged: but most commonly adopt the figure of those in the centre, without, however, suffering any alteration in point of sex; so that confusion is less to be apprehended from this mode of luxuriance than from the former; besides the length to which the florets in the centre run out is of itself a sufficient distinction, and adapted to excite at once an idea of luxuriance. Daisy, feverfew, and African marigold, exhibit instances of this as well as of the former mode of impletion.

In luxuriant compound flowers with plain florets, the *semiflosculosi* of Tournefort, the stigma or summit of the style in each floret is lengthened, and the seed-buds are enlarged and diverge; by which characters such flowers may always be distinguished from flowers of the same kind in a natural state. Scorzonera, nipple-wort, and goat's-beard, furnish frequent instances of the plenitude alluded to.

Lastly, the impletion of compound flowers with tubular or hollow florets, the *flosculosi* of Tournefort, seems to observe the same rules as that of radiated flowers just delivered. In everlasting-flower, the *xeranthemum* of Linnæus, the impletion is singular, being effected by the enlargement and expansion of the inward chaffy scales of the calyx. These scales, which become coloured, are greatly augmented in length, so as to overtop the florets, which are scarce larger than those of the same flower in a natural state. The florets too in the margin, which in the natural flower are female, become, by luxuriance, barren; that is, are deprived of the pistillum; the style, which was very short, spreads, and is of the length of the chaffy scales; and its summits, formerly two in number, are metamorphosed into one.

Full flowers are more easily referred to their respective genera in methods founded upon the calyx, as the flower-cup generally remains unaffected by this highest degree of luxuriance.

PLEONASM, a figure in *Rhetoric*, whereby we use words seemingly superfluous, in order to express a thought with the greater energy; such as, "I saw it with my own eyes," &c. See ORATORY, N° 67.

PLESCOW, a town of Russia, capital of a duchy of the same name, with an archbishop's see, and a strong castle. It is a large place, and divided into four parts, each of which is surrounded with walls. It is seated on the river Muldow, where it falls into the lake Plescow, 80 miles south of Narva, and 150 south by west of Petersburg. E. Long. 27. 52. N. Lat. 57. 58.

PLESCOW, a duchy in Russia, between the duchies of Novogorod, Lithuania, Livonia, and Ingria.

PLESSIS-LES-TOURS, formerly a royal palace of France, within half a league of Tours. It was built by Louis XI. and in it he died in the year 1483. It is situated in a plain surrounded by woods, at a small distance from the Loire. The building is yet handsome, though built of brick, and converted to purposes of commerce.

PLETHORA, in *Medicine*, from πληθος, "plenitude." A plethora is when the vessels are too much loaded with fluids. The plethora may be sanguine or serous. In the first there is too much crassamentum in the blood, in the latter too little. In the sanguine plethora, there is danger of a fever, inflammation, apoplexy, rupture of the blood-vessels, obstructed secretions, &c.: in the

the serous, of a dropsy, &c. A rarefaction of the blood produces all the effects of a plethora; it may accompany a plethora, and should be distinguished therefrom. Mr Bromfield observes, that a sanguine plethora may thus be known to be present by the pulse. An artery overcharged with blood is as incapable of producing a strong full pulse, as one that contains a deficient quantity; in both cases there will be a low and weak pulse. To distinguish rightly, the pulse must not be felt with one or two fingers on the carpal artery; but if three or four fingers cover a considerable length of the artery, and we press hard for some time on it, and then suddenly raise all these fingers except that which is nearest to the patient's hand, the influx of the blood, if there is a plethora, will be so rapid as to raise the other finger, and make us sensible of the fulness. The sanguine plethora is relieved by bleeding: the serous by purging, diuretics, and sweating. See MEDICINE *Index*.

PLEURA, in *Anatomy*, a thin membrane covering the inside of the thorax. See ANATOMY *Index*.

PLEURITIS, or PLEURISY. See MEDICINE *Index*.

PLEURONECTES, a genus of fishes belonging to the order of thoracici. See ICHTHYOLOGY *Index*.

PLEURS, a town in France, which was buried under a mountain in the year 1618. Of this fatal circumstance, Bishop Burnet, in his travels, p. 96. gives the following account. "Having mentioned (says the Bishop) some falls of mountains in these parts (viz. near the Alps), I cannot pass by the extraordinary fate of the town of Pleurs, about a league from Chavennes to the north.—The town was half the bigness of Chavennes, but much more nobly built; for, besides the great palace of the Francken, that cost some millions, there were many other palaces built by rich factors both of Milan and the other parts of Italy, who, liking the situation and air, as well as the freedom of the government, gave themselves all the indulgencies that a vast wealth could furnish. By one of the palaces that was a little distant from the town, and was not overwhelmed with it, one may judge of the rest. It was an out-house of the family of the Francken, and yet it may compare with many palaces in Italy. The voluptuousness of this place became very crying; and Madame de Salis told me that she heard her mother often relate some passages of a Protestant minister's sermons that preached in a little church there, who warned them often of the terrible judgments of God which were hanging over their heads, and which he believed would suddenly break out upon them.

"On the 25th of August 1618, an inhabitant came and told me to be gone, for he saw the mountains cleaving; but he was laughed at for his pains. He had a daughter whom he persuaded to leave all and go with him; but when she was safe out of town, she called to mind that she had not locked the door of a room in which she had some things of value, and so she went back to do that, and was buried with the rest; for at the hour of supper the hill fell down, and buried the town and all the inhabitants, to the number of 2200, so that not one person escaped. The fall of the mountains did so fill the channel of the river, that the first news those of Chavennes had of it was by the failing of their river; for three or four hours there came not a drop of water, but the river wrought for itself a new course, and returned to them.

"I could hear no particular character of the man who escaped (continues the Bishop); so I must leave the secret reason of so singular a preservation to the great discovery, at the last day, of those steps of Divine Providence that are now so unaccountable. Some of the family of the Francken, got some miners to work under ground, to find out the wealth that was buried in their house; for, besides their plate and furniture, there was a great deal of cash and many jewels in the house. The miners pretended they could find nothing; but they went to their country of Tyrol and built fine houses, and a great wealth appeared, of which no other visible account could be given but this, that they had found some of that treasure."

PLEXUS, among anatomists, a bundle of small vessels interwoven in the form of net-work; thus a congeries of vessels within the brain is called *plexus choroides*, *reticularis*, or *retiformis*. See ANATOMY.

A plexus of nerves is the union of two or more nerves, forming a sort of ganglion or knot.

PLICA POLONICA, or *Plaited Hair*, is a disease peculiar to Poland; whence the name. See MEDICINE, N° 355. Mr Coxe, who gives a short account of it, attempts likewise to give the physical causes of it. Many causes of this kind, he tells us, have been supposed to concur in rendering the plica more frequent in those regions than in other parts. It would be an endless work to enumerate the various conjectures with which each person has supported his favourite hypothesis.—The most probable are those assigned by Dr Vicat: The first cause is the nature of the Polish air, which is rendered insalubrious by numerous woods and morasses, and occasionally derives an uncommon keenness even in the midst of summer from the position of the Carpathian mountains; for the southern and south-easterly winds, which usually convey warmth in other regions, are in this chilled in their passage over their snowy summits. The second is, unwholesome water; for although Poland is not deficient in good springs, yet the common people usually drink that which is nearest at hand, taken indiscriminately from rivers, lakes, and even stagnant pools. The third cause is the gross inattention of the natives to cleanliness; for experience shows, that those who are not negligent in their persons and habitations, are less liable to be afflicted with the plica than others who are deficient in that particular. Thus persons of higher rank are less subject to this disorder than those of inferior stations; the inhabitants of large towns than those of small villages; the free peasants than those in an absolute state of vassalage; the natives of Poland Proper than those of Lithuania. Whatever we may determine as to the possibility that all or any of these causes, by themselves, or in conjunction with others, originally produced the disorder; we may venture to assert, that they all, and particularly the last, assist its propagation, inflame its symptoms, and protract its cure.

In a word, the plica polonica appears to be a contagious distemper; which, like the leprosy, still prevails among a people ignorant in medicine, and inattentive to check its progress, but is rarely known in those countries where proper precautions are taken to prevent its spreading.

PLIMPTON, a town of Devonshire, in England, seated on a branch of the river Plime, which had once a castle, now in ruins. It sends two members to parliament;

Plimpton ‖ Pliny.

ment; is ſeven miles E. of Plymouth, and 218 W. by S. of London. W. Long. 40. 0. N Lat. 50. 22.

PLINIA, a genus of plants belonging to the polyandria claſs of Linnæus. See BOTANY *Index*

PLINTH, ORLE, or *Orlo*, in *Architecture*, a flat ſquare member, in the form of a brick. It is uſed as the foundation of columns, being that flat ſquare table under the moulding of the baſe and pedeſtal at the bottom of the whole order. It ſeems to have been originally intended to keep the bottom of the original wooden pillars from rotting. Vitruvius alſo calls the Tuſcan abacus *plinth*.

PLINTH of a Statue, &c. is a baſe, either flat, round, or ſquare, that ſerves to ſupport it.

PLINTH of a Wall, denotes two or three rows of bricks advancing out from a wall; or, in general, any flat high moulding, that ſerves in a front-wall to mark the floors, to ſuſtain the eaves of a wall, or the larmier of a chimney.

PLINY the ELDER, or *Cæcilius Plinius Secundus*, one of the moſt learned men of ancient Rome, was deſcended from an illuſtrious family, and born at Verona. He bore arms in a diſtinguiſhed poſt; was one of the college of augurs; became intendant of Spain; and was employed in ſeveral important affairs by Veſpaſian and Titus, who honoured him with their eſteem. The eruption of Mount Veſuvius, which happened in the year 79, proved fatal to him. His nephew, Pliny the Younger, relates the circumſtances of that dreadful eruption, and the death of his uncle, in a letter to Tacitus. Pliny the Elder wrote a Natural Hiſtory in 37 books, which is ſtill extant, and has had many editions; the moſt eſteemed of which is that of Father Hardouin, printed at Paris in 1723, in two volumes folio.

PLINY the Younger, the nephew of the former, was born in the ninth year of Nero, and the 62d of Chriſt, at Novocomum, a town upon the lake Larius, near which he had ſeveral beautiful villas. Cæcilius was the name of his father, and Plinius Secundus that of his mother's brother, who adopted him. He brought into the world with him fine parts and an elegant taſte, which he did not fail to cultivate early; for, as he tells us himſelf, he wrote a Greek tragedy at 14 years of age. He loſt his father when he was young; and had the famous Virginius for his tutor or guardian, whom he has ſet in a glorious light. He frequented the ſchools of the rhetoricians, and heard Quintilian; for whom he ever after entertained ſo high an eſteem, that he beſtowed a conſiderable portion upon his daughter at her marriage. He was in his 18th year when his uncle died; and it was then that he began to plead in the forum, which was the uſual road to dignities. About a year after, he aſſumed the military character, and went into Syria with the commiſſion of tribune: but this did not ſuit his taſte any more than it had done Tully's; and therefore we find him returning after a campaign or two. He tells us, that in his paſſage homewards he was detained by contrary winds at the iſland Icaria, and how he employed himſelf in making verſes: he enlarges in the ſame place upon his poetical exercitations; yet poetry was not the ſhining part of his character any more than it had been of Tully's.

Upon his return from Syria, he married a wife, and ſettled at Rome: it was in the reign of Domitian. During this moſt perilous time, he continued to plead in the forum, where he was not more diſtinguiſhed by his uncommon abilities and eloquence, than by his great reſolution and courage, which enabled him to ſpeak boldly, when ſcarcely one elſe durſt ſpeak at all. On theſe accounts he was often ſingled out by the ſenate to defend the plundered provinces againſt their oppreſſive governors, and to manage other cauſes of a like important and dangerous nature. One of theſe was for the province of Bætica, in their proſecution of Bæbius Maſſa; in which he acquired ſo general an applauſe, that the emperor Nerva, then a private man, and in baniſhment at Tarentum, wrote to him a letter, in which he congratulated not only Pliny, but the age which had produced an example ſo much in the ſpirit of the ancients. Pliny relates this affair in a letter to Cornelius Tacitus; and he was ſo pleaſed with it himſelf, that he could not help intreating this friend to record it in his hiſtory. He intreats him, however, with infinitely more modeſty than Tully had intreated Lucceius upon the ſame occaſion: and though he might imitate Cicero in the requeſt, as he profeſſes to have conſtantly ſet that great man before him for a model, yet he took care not to tranſgreſs the bounds of decency in his manner of making it. He obtained the offices of queſtor and tribune, and luckily went unhurt through the reign of Domitian: there is, however, reaſon to ſuppoſe, if that emperor had not died juſt as he did, that Pliny would have ſhared the fate of many other great men; for he tells us himſelf, that his name was afterwards found in Domitian's tables, among the number of thoſe who were deſtined to deſtruction.

He loſt his wife in the beginning of Nerva's reign, and ſoon after married his beloved Calphurnia, of whom we read ſo much in his Epiſtles. He had not, however, any children by any of his wives: and hence we find him thanking Trajan for the *jus trium liberorum*, which he afterwards obtained of that emperor for his friend Suetonius Tranquillus. He hints alſo, in his letter of thanks to Trajan, that he had been twice married in the reign of Domitian. He was promoted to the conſulate by Trajan in the year 100, when he was 38 years of age; and in this office pronounced that famous panegyric, which has ever ſince been admired, as well for the copiouſneſs of the topics as the elegance of addreſs. Then he was elected augur, and afterwards made proconſul of Bithynia; whence he wrote to Trajan that curious letter concerning the primitive Chriſtians; which, with Trajan's reſcript, is happily extant among his Epiſtles. Pliny's letter, as Mr Melmoth obſerves in a note upon the paſſage, is eſteemed as almoſt the only genuine monument of eccleſiaſtical antiquity relating to the times immediately ſucceeding the apoſtles, it being written at moſt not above 40 years after the death of St Paul. It was preſerved by the Chriſtians themſelves, as a clear and unſuſpicious evidence of the purity of their doctrines, and is frequently appealed to by the early writers of the church againſt the calumnies of their adverſaries. It is not known what became of Pliny after his return from Bithynia; whether he lived at Rome, or what time he ſpent at his country houſes. Antiquity is alſo ſilent as to the time of his death: but it is conjectured that he died either a little before or ſoon after that excellent prince, his admired Trajan; that is, about the year of Chriſt 116.

Pliny was one of the greateſt wits, and one of the worthieſt

worthiest men, among the ancients. He had fine parts, which he cultivated to the utmost; and he accomplished himself with all the various kinds of knowledge which could serve to make him either useful or agreeable. He wrote and published a great number of things; but nothing has escaped the wreck of time except the books of Letters, and the panegyric upon Trajan. This has ever been considered as a masterpiece: and if he has, as some think, almost exhausted all the ideas of perfection in a prince, and gone perhaps a little beyond the truth, yet it is allowed that no panegyrist was ever possessed of a finer subject, and on which he might better indulge in all the flow of eloquence, without incurring the suspicion of flattery and lies. His letters seem to have been intended for the public; and in them he may be considered as writing his own memoirs. Every epistle is a kind of historical sketch, wherein we have a view of him in some striking attitude either of active or contemplative life. In them are preserved anecdotes of many eminent persons, whose works have come down to us, as Suetonius, Silius Italicus, Martial, Tacitus, and Quintilian; and of curious things, which throw great light upon the history of those times. They are written with great politeness and spirit; and if they abound too much in turn and metaphor, we must impute it to that degeneracy of taste which was then accompanying the degenerate manners of Rome. Pliny, however, seems to have preserved himself in this latter respect from the general contagion: whatever the manners of the Romans were, his were pure and incorrupt. His writings breathe a spirit of transcendent goodness and humanity: his only imperfection is, he was too desirous that the public and posterity should know how humane and good he was. We have two elegant English translations of his Epistles; the one by Mr Melmoth, and the other by Lord Orrery.

PLOCAMA, a genus of plants belonging to the pentandria class. See Botany *Index*.

PLOCE. See Oratory, p. 433.

PLOCKSKO, a town of Poland, and capital of a palatinate of the same name, with a castle and a bishop's see. The churches are very magnificent; and it is built upon a hill, whence there is a fine prospect every way, near the river Vistula. It is 25 miles south-east of Uladislaw, and 65 west of Warsaw. E. Long. 19. 29. N. Lat. 52. 46.

Plocksko, a palatinate of Poland, bounded on the north by Regal Prussia, on the east by the palatinate of Mazovia, on the south by the Vistula, and on the west by the palatinate of Inovladislaw. The capital town is of the same name.

PLOEN is a town of Germany in the circle of Lower Saxony, and capital of Holstein. It stands on the banks of a lake of the same name, and gave title to a duke, till by the death of the last duke Charles without male issue it escheated to the king of Denmark in 1761. The ducal palace, rising in the midst of the town, on an elevated spot of ground, and overlooking the lake, is a very picturesque object. The town stands 22 miles north-west of Lubeck, and 10 south-east of Kiell. E. Long. 10. 30. N. Lat. 54. 11.

PLOMO, in *Metallurgy*, is a name given by the Spaniards, who have the care of the silver mines, to the silver ore, when found adhering to the surface of stones, and when it incrusts their cracks and cavities like small and loose grains of gunpowder. Though these grains be few in number, and the rest of the stone have no silver in it, yet they are always very happy when they find it, as it is a certain token that there is a rich vein somewhere in the neighbourhood. And if in digging forwards they still meet with these grains, or the plomo in greater quantity, it is a certain sign that they are getting nearer and nearer the good vein.

PLOT, Dr Robert, a learned antiquarian and philosopher, was born at Sutton-barn, in the parish of Borden in Kent, in the year 1641, and studied in Magdalen-hall, and afterwards in University-college, Oxford. In 1682 he was elected secretary of the Royal Society, and published the Philosophical Transactions from N° 143 to N° 166 inclusive. The next year Elias Ashmole, Esq. appointed him first keeper of his museum, and about the same time the vice-chancellor nominated him first professor of chemistry in the university of Oxford. In 1687 he was made secretary to the Earl Marshal, and the following year received the title of *Historiographer* to King James II. In 1690 he resigned his professorship of chemistry, and likewise his place of keeper of the museum, to which he presented a very large collection of natural curiosities; which were those he had described in his histories of Oxfordshire and Staffordshire; the former published at Oxford in 1677, folio, and reprinted with additions and corrections in 1705; and the latter was printed in the same size in 1686. In January 1694-5, Henry Howard, Earl Marshal, nominated him Mobray-herald extraordinary; two days after which he was constituted register of the court of honour; and, on the 30th of April 1696, he died of the stone at his house in Borden.

As Dr Plot delighted in natural history, the above works were designed as essays towards a Natural History of England; and he had actually formed a design of travelling through England and Wales for that purpose. He accordingly drew up a plan of his scheme in a letter to the learned Bishop Fell; which is inserted at the end of the second volume of Leland's Itinerary, of the edition of 1744. Amongst several MSS. which he left behind him were large materials for the "Natural History of Kent, Middlesex, and the city of London." Besides the above works, he published *De origine fontium tentamen philosophicum*, 8vo, and nine papers in the Philosophical Transactions.

Plot, in dramatic poetry, is sometimes used for the fable of a tragedy or comedy; but more properly for the knot or intrigue, which makes the *embarras* of any piece. See Poetry.

Plot, in *Surveying*, the plan or draught of any field, farm, or manor, surveyed with an instrument, and laid down in the proper figure and dimensions.

PLOTINUS, a Platonic philosopher in the third century. He was born at Lycopolis a city of Egypt, in 204; and began very early to show a great singularity both in his taste and manners: for, at eight years of age, when he went to school, he used to run to his nurse, and uncover her breast to suck; and would have continued that practice longer, if he had not been discouraged by her. At 28 years of age he had a strong desire to study philosophy, on which occasion he was recommended to the most famous professors of Alexandria. He was not satisfied with their lectures; but upon

Plotinus. upon hearing thoſe of Ammonius, he confeſſed that this was the man he wanted. He ſtudied for 11 years under that excellent maſter, and then went to hear the Perſian and Indian philoſophers: for in 243, when the emperor Gordianus intended to wage war againſt the Perſians, he followed the Roman army, but probably repented of it; for it was with difficulty he could ſave his life by flight, after the emperor had been ſlain. He was then 39; and the year following he went to Rome, and read philoſophical lectures in that city; but avoided following the example of Erennius and Origen, his fellow-pupils, who, having promiſed with him not to reveal ſome hidden and excellent doctrines they had received from Ammonius, had nevertheleſs forfeited their word. Plotinus continued ten years in Rome, without writing any thing; but, in his 50th year, Porphyry became his ſcholar; who, being of an exquiſitely fine genius, was not ſatisfied with ſuperficial anſwers, but required to have all difficulties thoroughly explained; and therefore Plotinus, to treat things with greater accuracy, was obliged to write more books. He had before written 21 books, and during the ſix years of Porphyry's ſtay with him he wrote 24, and 9 after Porphyry's leaving Rome, in all 54. The Romans had a high veneration for him; and he paſſed for a man of ſuch judgement and virtue, that many perſons of both ſexes, when they found themſelves dying, intruſted him, as a kind of guardian angel, with the care of their eſtates and children. He was the arbiter of numberleſs law-ſuits; and conſtantly behaved with ſuch humanity and rectitude of mind, that he did not create himſelf one enemy during the 26 years he reſided in Rome. He, however, did not meet with the ſame juſtice from all of his own profeſſion; for Olympias a philoſopher of Alexandria, being envious of his glory, uſed his utmoſt endeavours, though in vain, to ruin him. The emperor Gallienus, and the empreſs Salonina, had a very high regard for him; and, had it not been for the oppoſition of ſome jealous courtiers, they would have had the city of Campania rebuilt, and given to him with the territory belonging to it, to eſtabliſh a colony of philoſophers, and to have it governed by the ideal laws of Plato's commonwealth. He laboured under various diſorders during the laſt year of his life, which obliged him to leave Rome, when he was carried to Campania to the heirs of one of his friends, who furniſhed him with every thing neceſſary; and he died there in the year 270, at the age of 66, and in the nobleſt manner that an heathen philoſopher could do, theſe being his words as he breathed his laſt: "I am labouring with all my might to return the divine part of me to the Divine Whole which fills the univerſe."

We have already remarked that the ideas of Plotinus were ſingular and extraordinary; and we ſhall now ſhow that they were ſo. He was aſhamed of being lodged in a body, for which reaſon he did not care to tell the place of his birth or family. The contempt he had for all earthly things, was the reaſon why he would not permit his picture to be drawn: and when his diſciple Amelius was urgent with him upon this head, "Is it not enough (ſaid he) to drag after us, whitherſoever we go, that image in which nature has ſhut us up? Do you think that we ſhould likewiſe tranſmit to future ages an image of that image, as a ſight worthy of their attention?" From the ſame principle, he refuſed to attend to his health; for he never made uſe of preſervatives or baths, and did not even eat the fleſh of tame animals. He ate but little, and abſtained very often from bread; which, joined to his intenſe meditation, kept him very much from ſleeping. In ſhort, he thought the body altogether below his notice; and had ſo little reſpect for it, that he conſidered it as a priſon, from which it would be his ſupreme happineſs to be freed. When Amelius, after his death, inquired about the ſtate of his ſoul of the oracle of Apollo, he was told, "that it was gone to the aſſembly of the bleſſed, where charity, joy, and a love of the union with God prevail:" and the reaſon given for it, as related by Porphyry, is, "that Plotinus had been peaceable, gracious, and vigilant; that he had perpetually elevated his ſpotleſs ſoul to God; that he had loved God with his whole heart; that he had diſengaged himſelf, to the utmoſt of his abilities, from this wretched life; that, elevating himſelf with all the powers of his ſoul, and by the ſeveral gradations taught by Plato, towards that Supreme Being which fills the univerſe, he had been enlightened by him; had enjoyed the viſion of him without the help or interpoſition of ideas; had, in ſhort, been often united to him." This is the account of Porphyry, who tells us alſo, that he himſelf had once been favoured with the viſion. To this account, however, we need ſcarcely add, that little credit is due: it agrees pretty much with modern enthuſiaſm and the reveries of Behmeniſts. Plotinus had alſo his familiar ſpirit, as well as Socrates; but, according to Porphyry, it was not one of thoſe called *demons*, but of the order of thoſe who are called *gods*; ſo that he was under the protection of a genius ſuperior to that of other men. The ſuperiority of his genius puffed him up not a little: for when Amelius deſired him to ſhare in the ſacrifices, which he uſed to offer up on ſolemn feſtivals, "It is their buſineſs (replied Plotinus) to come to me, not mine to go to them:" "which lofty anſwer (ſays Porphyry) no one could gueſs the reaſon of, or dared to aſk."

Porphyry put the 54 books of Plotinus in order, and divided them into ſix enneaſes. The greater part of them turn on the moſt high-flown ideas in metaphyſics; and this philoſopher ſeems, in certain points, not to differ much from Spinoza. He wrote two books to prove, that "all being is one and the ſame;" which is the very doctrine of Spinoza. He inquires, in another book, "Whether there are many ſouls, or only one?" His manner of compoſing partook of the ſingularity of his nature: he never read over his compoſitions after he had written them; he wrote a bad hand, and was not exact in his orthography: he ſtood in need, therefore, of a faithful friend to reviſe and correct his writings; and he choſe Porphyry for this purpoſe before Amelius, who had, however, been his diſciple 24 years, and was very much eſteemed by him. Some have accuſed Plotinus of plagiariſm, with regard to Numenius; a ſlander which Amelius refuted. Longinus was once much prejudiced againſt our great philoſopher, and wrote againſt his Treatiſe of Ideas, and againſt Porphyry's anſwer in defence of that treatiſe. He afterwards conceived a high eſteem for him; ſought induſtriouſly for all his books; and, in order to have them very correct, deſired Porphyry to lend him his copy; but at the ſame time wrote to him in the following manner: "I always obſerved to you, when we were to-

Plotinus || Pluche.

gether, when we were at a diftance from one another, as well as when you lived at Tyre, that I did not comprehend many of the fubjects treated of by Plotinus; but that I was extremely fond of his manner of writing, the variety of his knowledge, and the order and difpofition of his queftions, which are altogether philofophical." "This fingle paffage (fays Bayle) fhows the exalted genius, the exquifite difcernment, and judicious penetration of Longinus. It cannot be denied, that moft fubjects which this philofopher examines are incomprehenfible; neverthelefs, we difcover in his works a very elevated, fruitful, and capacious genius, and a clofe way of reafoning. Had Longinus been an injudicious critic, had he not poffeffed an exalted and beautiful genius, he would not have been fo fenfible of Plotinus's obfcurity: for no perfons complain lefs of the obfcurity of a book, than thofe whofe thoughts are confufed and underftanding is fhallow." Marfilius Ficinus, at the requeft of Cofmo de Medicis, made a Latin verfion of the works of Plotinus, with a fummary and analyfis of each book; which was printed at Bafil, firft by itfelf, in 1559, and afterwards with the Greek in 1580, folio. His life was written by Porphyry, the moft illuftrious of his difciples.

PLOTUS, or DARTER, a genus of birds belonging to the order anferes. See ORNITHOLOGY *Index*.

PLOUGH, in *Agriculture*, a machine for turning up the foil by the action of cattle, contrived to fave the time, labour, and expence, which, without this inftrument, muft have been employed in digging the ground, and fitting it for receiving all forts of feed. See AGRICULTURE.

PLOUGHMAN, the perfon who guides the plough in the operation of tilling.

PLOUGHING, in *Agriculture*, the turning up the earth with a plough. See AGRICULTURE, *paffim*.

PLOVER, the Englifh name of feveral fpecies of CHARADRIUS, ORNITHOLOGY *Index*.

PLOWDEN, EDMUND, ferjeant at law, defcended from an ancient family in Shropfhire, was born in 1517, and was firft a ftudent of the univerfity of Cambridge, where he fpent three years in the ftudy of philofophy and medicine. He then removed to Oxford, where, having continued his former ftudies about four years more, in 1552 he was admitted to the practice of phyfic and furgery: but probably finding the practice of the art of healing lefs agreeable than the ftudy, he entered himfelf of the Middle Temple, and began to read law. Wood fays, that in 1557 he was fummer reader to that fociety, and Lent-reader three years after, being then ferjeant and oracle of the law. He died in the year 1584, aged 67; and was buried in the Temple church. He wrote, 1. Commentaries or Reports of divers Cafes, &c. in the reigns of King Edward VI. Queen Mary, and Queen Elizabeth; London, 1571, 78, 99, 1613, &c. Written in the old Norman language. 2. Queries, or a Moot-book of cafes, &c. tranflated, methodized, and enlarged, by H. B. of Lincoln's-Inn. London, 1662, 8vo.

PLUCHE, ANTONY, a celebrated French writer, was born at Rheims in 1688, and having diftinguifhed himfelf by his engaging manners and proficiency in the belles-lettres, was appointed profeffor of humanity in the univerfity of that city. Two years after he obtained the chair of rhetoric, and was admitted into holy orders. The bifhop of Laon (Clermont) informed of his talents, conferred upon him the direction of the college of his epifcopal city. By his induftry and fuperior knowledge, a proper order and fubordination foon took place in it; but fome peculiar opinions refpecting the affairs of the time difturbed his tranquillity, and obliged him to quit his office. The intendant of Rouen, at the requeft of the celebrated Rollin, entrufted him with the education of his fon. Abbé Pluche having filled that place with fuccefs and great honour to himfelf, left Rouen and went to Paris, where, by the patronage of fome literary friends and his own excellent writings, he acquired a very diftinguifhed reputation for learning. He publifhed, 1. *Le Spectacle de la Nature* (Nature Difplayed), in 9 vols in 12mo. This work, which is equally inftructive and entertaining, is written with perfpicuity and elegance; but the form of dialogue which is adopted has rendered it rather prolix. The fpeakers, who are the Prior, the Count, and Countefs, are not diftinguifhed by any ftriking feature; but they have all the common character, which is tolerably pleafing, not excepting even that of the little chevalier de Breuil, who is, however, a mere fcholar. This is the opinion which Abbé Desfontaines has formed of this work. Though the author has given the converfations a pretty ingenious turn, and even fome vivacity, yet now and then they affume the tone of the college. 2. *Hiftoire du Ciel*, or Hiftory of the Heavens, in 2 vols in 12mo. In this performance we find two parts almoft independent of one another. The firft contains fome learned inquiries into the origin of the poetic heavens. It is nearly a complete mythology, founded upon ideas which are new and ingenious. The fecond is the hiftory of the opinions given by philofophers refpecting the formation of the world. The author fhows the inutility, the inconfiftency, and uncertainty, of the moft efteemed fyftems; and concludes with pointing out the excellence and fublime fimplicity of the Mofaic account. Befides a noble and well-turned expreffion, we find in it an erudition which does not fatigue the mind. As to the foundation of the fyftem explained in the firft part, though it appears extremely plaufible, we will not take upon us to fay how far it is true: Voltaire called it *Fable du Ciel*, or a Fable of the Heavens. 3. *De Linguarum artificio*; a work which he tranflated with this title, *La Mecanique des Langues*, in 12mo. In this treatife he propofes a fhort and eafy method of learning languages, which is by the ufe of tranflations inftead of themes or exercifes; his reflections on that fubject are judicious and well expreffed. 4. Harmony of the Pfalms and the Gofpel, or a Tranflation of the Pfalms and Hymns of the Church, with Notes relative to the Vulgate, the Septuagint, and Hebrew Text, printed at Paris in 1764, in 12mo. In 1749, Abbé Pluche retired to Varenne St Maure, where he gave himfelf up entirely to devotion and ftudy. Having become fo deaf that he could not hear without the help of a trumpet, the capital afforded him little entertainment. It was in this retreat that he died of an apoplexy on the 20th of November 1761, at the age of 73 years. He poffeffed thofe qualities which form the fcholar, the honeft man, and the Chriftian: temperate in his meals, true to his word, an affectionate parent, a fenfible friend, and a humane philofopher; he gave leffons of virtue in his life as well as his writings. His fubmiffion to all the dogmas of religion was very great. Some

Some Deiſts having been ſurpriſed that, in matters of faith, he ſhould think and ſpeak like the vulgar, his anſwer was, "I glory in doing ſo: It is infinitly more rational to believe the word of God, than to follow the glimmering lights of a reaſon which is limited and ſubject to error."

PLUG, certain pieces of timber, formed like the fruſtum of a cone, and uſed to ſtop the hauſe-holes and the breaches made in the body of a ſhip by cannon-balls; the former of which are called *hauſe-plugs*, and the latter *ſhot-plugs*, which are formed of various ſizes in proportion to the holes made by the different ſizes of ſhot, which may penetrate the ſhip's ſides or bottom in battle; accordingly they are always ready for this purpoſe.

PLUKENET, Leonard, a phyſician who flouriſhed in the reign of King Charles II. was one of the moſt excellent and laborious botaniſts of that or any other age. He was author of the *Phytographia Plukenetiana*, the *Almageſticum Britannicum*, and other works of the like kind, on which he ſpent the greateſt part of his life and fortune. His Phytography is mentioned with the higheſt encomiums in the Philoſophical Tranſactions for February 1696-7. His *Opera Botanica*, with cuts, were printed at London in 6 vols folio, in 1720.

PLUM-tree. See Prunus, Botany *Index*.

PLUMAGE, the feathers which ſerve birds for a covering. See Ornithology.

PLUMB-line, among artificers, denotes a perpendicular to the horizon; ſo called, as being commonly erected by means of a plummet.

PLUMBAGO, Lead-wort; a genus of plants belonging to the pentandria claſs. See Botany *Index*.

Plumbago, or *Black-Lead*. See Graphite, Mineralogy *Index*.

PLUMBERY, the art of caſting and working lead, and uſing it in building.

As this metal melts ſoon and with little heat, it is eaſy to caſt it into figures of any kind, by running it into moulds of braſs, clay, plaſter, &c. But the chief article in plumbery is ſheets and pipes of lead; and as theſe make the baſis of the plumber's work, we ſhall here give the proceſs of making them.

In caſting *ſheet-lead*, a table or mould is made uſe of, which conſiſts of large pieces of wood well jointed, and bound with bars of iron at the ends; on the ſides of which runs a frame conſiſting of a ledge or border of wood, three inches thick and four inches high from the mould, called the *ſharps*: The ordinary width of the mould, within theſe ſharps, is from four to five feet; and its length is 16, 17, or 18 feet. This ſhould be ſomething longer than the ſheets are intended to be, in order that the end where the metal runs off from the mould may be cut off, becauſe it is commonly thin or uneven, or ragged at the end. It muſt ſtand very even or level in breadth, and ſomething falling from the end in which the metal is poured in, viz. about an inch or an inch and a half in the length of 16 or 17 feet or more, according to the thickneſs of the ſheets wanted; for the thinner the ſheet, the more declivity the mould ſhould have. At the upper end of the mould ſtands the pan, which is a concave triangular priſm, compoſed of two planks nailed together at right angles, and two triangular pieces fitted in between them at the ends. The length of this pan is the whole breadth of the mould in which the ſheets are caſt; it ſtands with its bottom, which is a ſharp edge, on a form at the end of the mould, leaning with one ſide againſt it; and on the oppoſite ſide is a handle to lift it up by, to pour out the melted lead; and on that ſide of the pan next the mould are two iron hooks to take hold of the mould, and prevent the pan from ſlipping while the melted lead is pouring out of it into the mould. This pan is lined on the inſide with moiſtened ſand, to prevent it from being fired by the hot metal. The mould is alſo ſpread over, about two inches thick, with ſand ſifted and moiſtened, which is rendered perfectly level by moving over it a piece of wood called a *ſtrike*, and ſmoothing it over with a ſmoothing plane, which is a plate of poliſhed braſs, about one-fourth of an inch thick and nine inches ſquare, turned up on all the four edges, and with a handle fitted on to the upper or concave ſide. The ſand being thus ſmoothed, it is fit for caſting ſheets of lead: but if they would caſt a ciſtern, they meaſure out the bigneſs of the four ſides; and having taken the dimenſions of the front or fore-part, make mouldings by preſſing long ſlips of wood, which contain the ſame mouldings, into the level ſand; and form the figures of birds, beaſts, &c. by preſſing in the ſame manner leaden figures upon it, and then taking them off, and at the ſame time ſmoothing the ſurface where any of the ſand is raiſed up by making theſe impreſſions upon it. The reſt of the operation is the ſame in caſting either ciſterns or plain ſheets of lead. But before we proceed to mention the manner in which that is performed, it will be neceſſary to give a more particular deſcription of the *ſtrike*. The ſtrike, then, is a piece of board about five inches broad, and ſomething longer than the breadth of the mould on the inſide; and at each end is cut a notch about two inches deep, ſo that when it is uſed it rides upon the ſharps with thoſe notches. Before they begin to caſt, the ſtrike is made ready by tacking on two pieces of an old hat on the notches, or by ſlipping a caſe of leather over each end, in order to raiſe the under ſide about one-eighth of an inch or ſomething more above the ſand, according as they would have the ſheet to be in thickneſs; then they tallow the under edge of the ſtrike, and lay it acroſs the mould. The lead being melted, it is put into the pan with ladles, in which, when there is a ſufficient quantity for the preſent purpoſe, the ſcum of the metal is ſwept off with a piece of board to the edge of the pan, letting it ſettle on the ſand, which is by this means prevented from falling into the mould at the pouring out of the metal. When the lead is cool enough, which muſt be regulated according to the thickneſs of the ſheets wanted, and is known by its beginning to ſtand with a ſhell or wall on the ſand round the pan, two men take the pan by the handle, or elſe one of them lifts it by the bar and chain fixed to a beam in the ceiling, and pour it into the mould, while another man ſtands ready with the ſtrike, and, as ſoon as they have done pouring in the metal, puts on the mould, ſweeps the lead forward, and draws the overplus into a trough prepared to receive it. The ſheets being thus caſt, nothing remains but to roll them up or cut them into any meaſure wanted: but if it be a ciſtern, it is bent into four ſides, ſo that the two ends may join the back, where they are ſoldered together; after which the bottom is ſoldered up.

The method of caſting pipes without ſoldering.—To make

make these pipes they have a kind of little mill, with arms or levers to turn it withal. The moulds are of brass, and consist of two pieces, which open and shut by means of hooks and hinges, their inward caliber or diameter being according to the size of the pipe, usually two feet and a half. In the middle is placed a core or round piece of brass or iron, somewhat longer than the mould, and of the thickness of the inward diameter of the pipe. This core is passed through two copper rundles, one at each end of the mould, which they serve to close; and to these is joined a little copper tube about two inches long, and of the thickness the leaden pipe is intended to be of. By means of these tubes, the core is retained in the middle of the cavity of the mould. The core being in the mould, with the rundles at its two ends, and the lead melted in the furnace, they take it up in a ladle, and pour it into the mould by a little aperture at one end, made in the form of a funnel. When the mould is full, they pass a hook into the end of the core, and, turning the mill, draw it out; and then opening the mould, take out the pipe. If they desire to have the pipe lengthened, they put one end of it in the lower end of the mould, and pass the end of the core into it; then shut the mould again, and apply its rundle and tube as before, the pipe just cast serving for a rundle, &c. at the other end. Things being thus replaced, they pour in fresh metal, and repeat the operation till they have got a pipe of the length required.

For making pipes of sheet-lead, the plumbers have wooden cylinders, of the length and thickness required; and on these they form their pipes by wrapping the sheet around them, and soldering up the edges all along them.

The lead which lines the Chinese tea-boxes is reduced to a thinness which we are informed European plumbers cannot imitate. The following account of the process by which the plates are formed was communicated to a writer in the Gentleman's Magazine by an intelligent officer of an East Indiaman. The caster sits by a pot containing the melted metal; and has two large stones, the under one fixed, the upper moveable, directly before him. He raises the upper stone by pressing his foot upon the side of it, and with an iron ladle pours in the opening a proper quantity of the fluid metal. He then immediately lets fall the upper stone, and by that means forms the lead into a thin irregular plate, which is afterwards cut into a proper shape. The surfaces of the stones, where they touch each other, are exactly ground together.

PLUMBUM, Lead. See Lead, Chemistry *Index*.

Plumbum Corneum, or muriate of lead, a combination of lead with muriatic acid. See Lead, Chemistry *Index*.

PLUME, or Plumula, in *Botany*, the bud or germ. See Gemma.

PLUMIER, Charles, a learned Minim, born at Marseilles, and one of the most able botanists of the 17th century. He was instructed by the famous Maignan, who taught him mathematics, turnery, the art of making spectacles, burning-glasses, microscopes, and other works. He at length went to Rome to perfect himself in his studies, and there applied himself entirely to botany under a skilful Italian. At his return to Provence, he settled in the convent at Bornes, a maritime place near Hieres, where he had the conveniency of making discoveries in the fields with respect to simples. He was some time after sent by the French king to America, to bring from thence such plants as might be of service in medicine. He made three different voyages to the Antilles, and visited the island of St Domingo. The king honoured him with a pension; and he at last settled at Paris. However, at the desire of M. Fagon, he prepared to go a fourth time to America, to examine the tree which produces the Jesuits bark; but died at the port of Santa Maria, near Cadiz, in 1706. He wrote several excellent works; the principal of which are, 1. A volume of the Plants in the American Islands. 2. A Treatise on the American Fern. 3. The Art of Turnery; a curious work embellished with plates.

PLUMMET, *Plumb-Rule*, or *Plumb-line*, an instrument used by carpenters, masons, &c. in order to judge whether walls, &c. be upright planes, horizontal, or the like. It is thus called from a piece of lead, fastened to the end of a cord, which usually constitutes this instrument. Sometimes the string descends along a wooden ruler, &c. raised perpendicularly on another; in which case it becomes a level.

PLUMMING, among miners, is the method of using a mine-dial, in order to know the exact place of the work where to sink down an air-shaft, or to bring an adit to the work, or to know which way the load inclines when any flexure happens in it.

It is performed in this manner: A skilful person with an assistant, and with pen, ink, and paper, and a long line, and a mine-dial, after his guess of the place above ground, descends into the adit or work, and there fastens one end of the line to some fixed thing in it; then the incited needle is let to rest, and the exact point where it rests is marked with a pen: he then goes on farther in, the line still fastened, and at the next flexure of the adit he makes a mark on the line by a knot or otherwise: and then letting down the dial again, he there likewise notes down that point at which the needle stands in this second position. In this manner he proceeds, from turning to turning, marking down the points, and marking the line, till he comes to the intended place: this done, he ascends and begins to work on the surface of the earth what he did in the adit, bringing the first knot in the line to such a place where the mark of the place of the needle will again answer its pointing, and continues this till he come to the desired place above ground, which is certain to be perpendicular over the part of the mine into which the air-shaft is to be sunk.

PLUMOSE, something formed in the manner of a feather, with a stem and fibres issuing from it on each side; such are the antennæ of certain moths, butterflies, &c.

PLURAL, in *Grammar*, an epithet applied to that number of nouns and verbs which is used when we speak of more than one thing. See Grammar.

PLURALITY, a discrete quality, consisting of two or a greater number of the same kind: thus we say, a plurality of gods, &c. See the article Astronomy, N° 157. for the arguments both for and against a plurality of worlds.

Plurality.

PLURALITY of Benefices, or *Livings*, is where the ſame clerk is poſſeſſed of two or more ſpiritual preferments with cure of ſouls. See BENEFICE.

The ſmallneſs of ſome benefices firſt gave riſe to pluralities; for an eccleſiaſtic, unable to ſubſiſt on a ſingle one, was allowed to hold two; and at length the number increaſed without bounds. A remedy was attempted for this abuſe at the council of Lateran under Alexander III. and Innocent III. in the year 1215, when the holding more than one benefice was forbid by a canon under the penalty of deprivation; but the ſame canon granting the pope a power to diſpenſe with it in favour of perſons of diſtinguiſhed merit, the prohibition became almoſt uſeleſs. They were alſo reſtrained by ſtatute 21 Hen. VIII. cap. 13. which enacts, that if any perſon having one benefice with cure of ſouls, of the yearly value of 8l. or above (in the king's books), accept any other with cure of ſouls, the firſt ſhall be adjudged in law to be void, &c. though the ſame ſtatute provides for diſpenſation in certain caſes.

In England, in order to procure a diſpenſation, the preſentee muſt obtain of the biſhop, in whoſe dioceſe the livings are, two certificates of the values in the king's books, and the reputed values and diſtance; one for the archbiſhop, and the other for the lord-chancellor. And if the livings lie in two dioceſes, then two certificates of the ſame kind are to be obtained from each biſhop. He muſt alſo ſhow the archbiſhop his preſentation to the ſecond living; and bring with him two teſtimonials from the neighbouring clergy concerning his behaviour and converſation, one for the archbiſhop and the other for the lord-chancellor; and he muſt alſo ſhow the archbiſhop his letters of orders, and a certificate of his having taken the degree of maſter of arts at the leaſt, in one of the univerſities of this realm, under the hand of the regiſter. And if he be not doctor or bachelor of divinity, nor doctor nor bachelor of law, he is to procure a qualification of a chaplain, which is to be duly regiſtered in the faculty office, in order to be tendered to the archbiſhop, according to the ſtatute. And if he hath taken any of the aforeſaid degrees, which the ſtatute allows as qualifications, he is to procure a certificate thereof as already mentioned, and to ſhow the ſame to the archbiſhop; after which his diſpenſation is made out at the faculty office, where he gives ſecurity according to the direction of the canon. He muſt then repair to the lord-chancellor for confirmation under the broad ſeal; and he muſt apply to the biſhop of the dioceſe where the living lies for his admiſſion and inſtitution. By the ſeveral ſtamp acts, for every ſkin, or paper, or parchment, &c. on which any diſpenſation to hold two eccleſiaſtical dignities or benefices, or a dignity and a benefice, ſhall be engroſſed or written, there ſhall be paid a treble 40s. ſtamp duty.

We have alſo a regulation in regard to pluralities; but it is often diſpenſed with: for, by the faculty of diſpenſation, a pluraliſt is required, in that benefice from which he ſhall happen to be moſt abſent, to preach 13 ſermons every year, and to exerciſe hoſpitality for two months yearly.

In Germany the pope grants diſpenſation for poſſeſſing a plurality of benefices, on pretence that the eccleſiaſtical princes there need large revenues to bear up againſt the Proteſtant princes.

Plus ‖ Plutarch.

PLUS, in *Algebra*, a character marked thus +, uſed for the ſign of addition. See ALGEBRA.

PLUSH, in commerce, &c. a kind of ſtuff, having a ſort of velvet knap or ſhag on one ſide, compoſed regularly of a woof of a ſingle woollen thread and a double warp; the one wool, of two threads twiſted; the other goats or camels hair; though there are ſome pluſhes entirely of worſted, and others compoſed wholly of hair.

PLUTARCH, a great philoſopher and hiſtorian of antiquity, who lived from the reign of Claudius to that of Hadrian, was born at Chæronea, a ſmall city of Bœotia in Greece. Plutarch's family was ancient in Chæronea: his grandfather Lamprias was eminent for his learning and a philoſopher; and is often mentioned by Plutarch in his writings, as is alſo his father. Plutarch was initiated early in ſtudy, to which he was naturally inclined; and was placed under the care of Ammonius, an Egyptian, who, having taught philoſophy with great reputation at Alexandria, from thence travelled into Greece, and ſettled at Athens. Under this maſter he made great advances in knowledge; and like a thorough philoſopher, more apt to regard things than words, he purſued this knowledge, to the neglect of languages. The Roman language at that time was not only the language of Rome, but of Greece alſo: and much more uſed there than the French is now in England. Yet he was ſo far from regarding it then, that, as we learn from himſelf, he became not converſant in it till the declenſion of his life: and though he is ſuppoſed to have reſided in Rome near 40 years at different times, yet he never ſeems to have acquired a competent ſkill in it. But this was not the worſt: he did not cultivate his mother-tongue with any great exactneſs; and hence that harſhneſs, inequality and obſcurity in his ſtyle, which has ſo frequently and ſo juſtly been complained of.

After he was principled and grounded by Ammonius, having an inſatiable thirſt for knowledge, he reſolved to travel. Egypt was at that time, as formerly it had been, famous for learning; and probably the myſteriousneſs of their doctrine might tempt him, as it had tempted Pythagoras and others, to go and converſe with the prieſthood of that country. This appears to have been particularly his buſineſs, by his treatiſe *Of Iſis and Oſiris*: in which he ſhows himſelf verſed in the ancient theology and philoſophy of the wiſe men. From Egypt he returned into Greece; and viſiting in his way all the academies and ſchools of the philoſophers, gathered from them many of thoſe obſervations with which he has abundantly enriched poſterity. He does not ſeem to have been attached to any particular ſect, but culled from each of them whatever he thought excellent and worthy to be regarded. He could not bear the paradoxes of the Stoics, but yet was more averſe from the impiety of the Epicureans: in many things he followed Ariſtotle; but his favourites were Socrates and Plato, whoſe memory he revered ſo highly, that he annually celebrated their birth-days with much ſolemnity. Beſides this, he applied himſelf with extreme diligence to collect not only all books that were excellent in their kind, but alſo all the ſayings and obſervations of wiſe men which he had heard in converſation or had received from others by tradition; and likewiſe to con-

ſult

Plutarch. fult the records and public instruments preserved in cities which he had visited in his travels. He took a particular journey to Sparta, to search the archives of that famous commonwealth, to understand thoroughly the model of their ancient government, the history of their legislators, their kings, and their ephori; and digested all their memorable deeds and sayings with much care. He took the same methods with regard to many other commonwealths; and thus was enabled to leave us in his works such a rich cabinet of observations upon men and manners, as, in the opinion of Montaigne and Bayle, have rendered him the most valuable author of antiquity.

The circumstances of Plutarch's life are not known, and therefore cannot be related with any exactness. According to the learned Fabricius, he was born under Claudius, 50 years after the Christian era. He was married to a most amiable woman of his own native town, whose name, according to the probable conjecture of Rualdus, was Timoxena, and to whose sense and virtue he has borne the most affectionate testimony in his moral works. He had several children, and among them two sons; one called *Plutarch* after himself, the other *Lamprias* in memory of his grandfather. Lamprias was he, of all his children, who seems to have inherited his father's philosophy; and to him we owe the table or catalogue of Plutarch's writings, and perhaps also his apophthegms. He had a nephew, Sextus Chæroneus, who taught the learned emperor Marcus Aurelius the Greek tongue, and was much honoured by him. Some think, that the critic Longinus was of his family; and Apuleius, in the first book of his Metamorphoses, affirms himself to be descended from him.

On what occasion, and at what time of his life, he went to Rome, how long he lived there, and when he finally returned to his own country, are all uncertain. It is probable, that the fame of him went thither before him, not only because he had published several of his works, but because immediately upon his arrival, as there is reason to believe, he had a great resort of the Roman nobility to hear him: for he tells us himself, that he was so taken up in giving lectures of philosophy to the great men of Rome, that he had not time to make himself master of the Latin tongue, which is one of the first things that would naturally have engaged his attention. It appears that he was several times at Rome; and perhaps one motive for his living there was the intimacy he had contracted in some of these journeys with Sossius Senecio, a great and worthy man, who had been four times consul, and to whom Plutarch has dedicated many of his lives. But the great inducement which carried him first to Rome, was undoubtedly that which had carried him into so many other parts of the world; namely, to make observations upon men and manners, and to collect materials for writing the lives of the Roman worthies, in the same manner as he had already written those of the Grecian: and accordingly he not only conversed with all the living, but searched the records of the Capitol, and of all the libraries. Not but, as we learn from Suidas, he was intrusted also with the management of public affairs in the empire, during his residence in the metropolis. "Plutarch (says he) lived in the time of Trajan, who bestowed on him the consular ornaments, and also caused an edict to be passed, that the magistrates or officers of Illyria should do nothing in that province without his knowledge and approbation."

Plutarch, Pluto.

When and how he was made known to Trajan is likewise uncertain: but it is generally supposed that Trajan, a private man when Plutarch first came to Rome, was, among other nobility, one of his auditors. It is also supposed, that this wise emperor made use of him in his councils; at least, much of the happiness of his reign has been imputed to Plutarch. Fabricius asserts that he was Trajan's preceptor, and that he was raised to the consular dignity by him, and made procurator of Greece in his old age by the emperor Adrian. We are equally at a loss concerning the time of his abode in the imperial city; which, however, at different times, is not imagined to fall much short of 40 years. The desire of visiting his native country, so natural to all men, and especially when growing old, prevailed with him at length to leave Italy: and at his return he was unanimously chosen archon or chief magistrate of Chæronea, and not long after admitted into the number of the Delphic Apollo's priests. We have no particular account of his death, either as to the manner of it or the year; only it is evident that he lived, and continued his studies, to a good old age. The most probable conjecture is that of Fabricius, who says he died in the fifth year of Adrian, at the age of 70.

His works have been divided, and they admit of a pretty equal division, into Lives and Morals: the former of which, in his own estimation, were to be preferred as more noble than the latter. His style, as we have already observed, has been excepted to with some reason: he has also been criticised for some mistakes in Roman antiquities, and for a little partiality to the Greeks. On the other hand, he has been justly praised for the copiousness of his fine sense and learning, for his integrity, and for a certain air of goodness which appears in all he wrote. His business was not to please the ear, but to instruct and charm the mind; and in this none ever went beyond him. Of his moral writings it is to be regretted that we have no elegant English translation. Even his Lives were chiefly known to the English reader by a motley and miserable version, till a new one executed with fidelity and spirit was presented to the public by the Langhornes in 1770. On the whole, it is to be wished that this most amiable moralist and biographer had added a life of himself to those which he has given to the world of others, as the particulars which other writers have preserved of his personal history are very doubtful and imperfect.

PLUTO, in Pagan worship, the king of the infernal regions, was the son of Saturn and Ops, and the brother of Jupiter and Neptune. This deity finding himself childless and unmarried, mounted his chariot to visit the world; and arriving in Sicily, fell in love with Proserpine, whom he saw gathering flowers with her companions in the valley of Enna, near Mount Ætna: when, forcing her into his chariot, he drove her to the river Chemarus, through which he opened himself a passage back to the realms of night. See CERES and PROSERPINE.

Pluto is usually represented in an ebony chariot drawn by four black horses; sometimes holding a sceptre, to denote his power; at others, a wand, with which he drives away the ghosts; and at others, some keys, to signify that he had the keys of death. Homer observes, that

Pluto || Plymouth.

that his helmet had the quality of rendering the wearer invisible, and that Minerva borrowed it in order to be concealed from Mars when she fought against the Trojans. Pluto was greatly revered both by the Greeks and Romans, who erected temples and altars to him. To this god sacrifices were offered in the night, and it was not lawful to offer them by day.

PLUTUS, in Pagan worship, the god of riches, is frequently confounded with Pluto. He was represented as appearing lame when he approached, and with wings at his departure; to show the difficulty of amassing wealth and the uncertainty of its enjoyment. He was also frequently represented blind, to show that he often bestowed his favours on the most unworthy, and left in necessity those who had the greatest merit.

PLUVIALIS, a species of plover. See CHARADRIUS, ORNITHOLOGY *Index*.

PLUVIUS, a surname of Jupiter. He was invoked by that name among the Romans whenever the earth was parched up by continual heat, and was in want of refreshing rains. He had an altar in the temple on the capitol.

PLYERS, in fortification, denote a kind of balance used in raising or letting down a draw-bridge. They consist of two timber levers, twice as long as the bridge they lift, joined together by other timbers framed in the form of a St Andrew's cross to counterpoise them. They are supported by two upright jams, on which they swing; and the bridge is raised or let down by means of chains joining the ends of the plyers and bridge.

PLYING, in the sea language, the act of making, or endeavouring to make, a progress against the direction of the wind. Hence a ship that advances well in her course in this manner of sailing, is said to be a good plyer. See the articles BEATING, PITCHING, and TACKING.

PLYMOUTH, a town of Devonshire, in England, about 215 miles from London, stands between the rivers Plym and Tamar, just before they fall into the British channel. From a mere fishing village it has become one of the largest towns in the county; and is one of the chief magazines in the kingdom, on account of its port, which is one of the safest in England, and which is so large as to be able to contain 1000 sail. It is defended by several different forts, mounting altogether nearly 300 guns; of which the chief is the Royal Citadel erected in the reign of Charles II. opposite to St Nicholas island, which is within the circuit of its walls, and contains a large store-house and five regular bastions. In time of war the outward-bound convoys generally rendezvous at Plymouth, and homeward-bound ships generally put in to provide pilots up the Channel. It is also a great place of resort for men of war that are wind-bound.

The mouth of the Tamar is called Ham-Ooze, and that of Plym Catwater, which are both commanded by the castle on St Nicholas island. About two miles up the mouth of the Tamar there are four docks, two of which were built in the reign of William III. one wet and the other dry, and two which have been built since. They have every conveniency for building or repairing ships. One of the docks is hewn out of a mine of slate, and lined with Portland stone. This town enjoys a pilchard fishery of considerable importance, and carries on an extensive trade with Newfoundland and the Straits. There is a customhouse in it; and though there are two churches (and besides several meeting-houses), yet each church has so large a cure of souls, that the parish clerks were till very lately in deacons orders, to enable them to perform all the occasional and other offices. The seat-rents are given to the poor. The lecturers are chosen every three years by the corporation, which was constituted by Henry VI. and consists of a mayor, 12 aldermen, and 24 common-council men. The mayor is elected by a jury of 36 persons, chosen by four others, two of whom are appointed by the mayor and aldermen, and the other two by the common-council. There is also a recorder, and a town-clerk. The population in 1801 exceeded 43,000. The town consists of four divisions, which were anciently governed by four captains, each of whom had three constables under him. It is well supplied with fresh water, which was brought from the distance of seven miles, by Sir Francis Drake a native of the town. The toll of the markets and of the cotton, yarn, &c. with the profit of the mill, which is very considerable, belongs to the corporation, as do the revenues of the shambles, which are farmed out for the mayor's kitchen. There is a charity-school in Plymouth, four hospitals, and a workhouse, in all which 100 poor children are clothed, fed, and taught; and there are two printing-houses. To one of the hospitals Colonel Jory gave a charity for 12 poor widows, as he did a mace worth 120l. to be carried before the mayor, and six good bells, valued at 500l. to Charles-Church, so called from our kings in whose reigns it was begun and finished. In the entrance of the bay lies the famous Eddystone rock, which is covered at high water, and on which the ingenious Mr Winstanley built a light-house, that was blown down in the terrible hurricane of Nov. 27th 1703, and himself, with others that were with him in it, never more heard of. However, another was erected in the room of it, by the corporation of the Trinity-house, in the time of Queen Anne, which was destroyed by an accidental fire Dec. 4th 1755, but rebuilt in 1759: which also was burnt down, and rebuilt by the celebrated Smeaton in the year 1770. In the reign of Edward III. the French landed, and burnt part of the town, but were soon repulsed by Hugh Courtenay earl of Devon. In the reign of Henry IV. the French landed here again, and burnt 600 houses. Between this town and the sea is a hill called the Haw, which has a delightful plain on the top, having a pleasant prospect all round it, and a good landmark for the use of mariners. The list of parliament-men for this borough, formerly divided into two parts, by the names of Sutton-Valtort and Sutton-Prior, commences the 26th of Edward I. and continues to the 14th of Edward III. after which we find no return made for it till the 20th of Henry VI. when the privilege was renewed. On the Haw is a fort, which at once commands the town and defends the harbour. Here is a ferry over the Tamar, called Crumwell or Crimble Passage, the west side of which is called Westone-House, and is in Devonshire, though most of the parish wherein it stands is in Cornwall. In April 1759 parliament granted 25,159l. for the better fortifying the town and dock of Plymouth. N. Lat. 50. 26. W. Long. 4. 15.

PLYMOUTH, in New England, a sea-port town, and capital of the county of the same name, in the province of

Plymouth, Plynteria. of Maſſachuſets Bay, in North America, with about 2000 inhabitants. It is remarkable for having been the firſt ſettlement in New England, and for having had the firſt place of worſhip. It is ſeated at the ſouth end of Plymouth bay. W. Long. 70. 40. N. Lat. 41. 58.

PLYNTERIA, a Grecian feſtival in honour of Aglauros, or rather of Minerva, who received from the daughter of Cecrops the name of Aglauros. The word is derived from πλυνειν, *lavare*, becauſe during the ſolemnity they undreſſed the ſtatue of the goddeſs and waſhed it. The day on which it was obſerved was looked upon as unfortunate and inauſpicious; and therefore no perſon was permitted to appear in the temples, as they were purpoſely ſurrounded with ropes. The arrival of Alcibiades in Athens that day was thought very unfortunate, but the ſucceſs that ever after attended him proved it to be otherwiſe. It was cuſtomary at this feſtival to bear in proceſſion a cluſter of figs; which intimated the progreſs of civilization among the firſt inhabitants of the earth, as figs ſerved them for food after they had found a diſlike for acorns. Plynteria.

PNEUMATICS.

1 Definition of the term. THIS term is reſtricted, in the preſent habits of our language, to that part of natural philoſophy which treats of the mechanical properties of elaſtic fluids. The word, in its original meaning, expreſſes a quality of air, or more properly of breath. Under the article PHYSICS we obſerved, that in a great number of languages the term uſed to expreſs breath was alſo one of the terms uſed to expreſs the animating principle, nay, the intellectual ſubſtance, the ſoul. It has been perhaps owing to ſome attention to this chance of confuſion that our philoſophers have appropriated the term PNEUMATICS to the ſcience of the mechanical properties of air, and PNEUMATOLOGY to the ſcience of the intellectual phenomena conſequent on the operations or affections of our thinking principle.

2 Extent of the ſcience. We have extended (on the authority of preſent cuſtom) the term PNEUMATICS to the ſtudy of the mechanical properties of all elaſtic or ſenſibly compreſſible fluids, that is, of fluids whoſe elaſticity and compreſſibility become an intereſting object of our attention; as the term HYDROSTATICS is applied to the ſtudy of the mechanical properties of ſuch bodies as intereſt us by their fluidity or liquidity only, or whoſe elaſticity and compreſſibility are not familiar or intereſting, though not leſs real or general than in the caſe of air and all vapours.

3 No preciſe limit to the different claſſes of bodies. We may be indulged in the obſervation by the bye, that there is no preciſe limit to the different claſſes of natural bodies with reſpect to their mechanical properties. There is no ſuch thing as a body perfectly hard, perfectly ſoft, perfectly elaſtic, or perfectly incompreſſible. All bodies have ſome degree of elaſticity intermixed with ſome degree of ductility. Water, mercury, oil, are compreſſible; but their compreſſibility need not be attended to in order perfectly to underſtand the phenomena conſequent on their materiality, fluidity, and gravity. But if we neglect the compreſſibility of air, we remain ignorant of the cauſe and nature of its moſt intereſting phenomena, and are but imperfectly informed with reſpect to thoſe in which its elaſticity has no ſhare; and it is convenient to attend to this diſtinction in our reſearches, in order to underſtand thoſe phenomena which depend ſolely or chiefly on compreſſibility and elaſticity. This obſervation is important; for here elaſticity appears in its moſt ſimple form, unaccompanied with any other mechanical affection of matter (if we except gravity), and lies moſt open to our obſervation, whether employed for inveſtigating the nature of this very property of bodies, or for explaining its mode of action. We ſhall even find that the conſtitution of an avowedly elaſtic fluid, whoſe compreſſibility is ſo very ſenſible, will give us the diſtincteſt notions of fluidity in general, and enable us to underſtand its *characteriſtic appearances*, by which it is diſtinguiſhed from ſolidity, namely, the *equable* diſtribution of preſſure through all its parts in every direction, and the horizontality which its ſurface aſſumes by the action of gravity: phenomena which have been aſſumed as equivalent to the definition of a perfect fluid, and from which all the laws of hydroſtatics and hydraulics have been derived. And theſe laws have been applied to the explanation of the phenomena around us; and water, mercury, oil, &c. have been denominated fluid only becauſe their appearances have been found to tally exactly with theſe conſequences of this definition, while the definition itſelf remains in the form of an aſſumption, unſupported by any other proof of its obtaining in nature. A real mechanical philoſopher will therefore attach himſelf with great eagerneſs to this property, and conſider it as an introduction to much natural ſcience.

Of all the ſenſible compreſſible fluids air is the moſt familiar, was the firſt ſtudied, and the moſt minutely examined. It has therefore been generally taken as the example of their mechanical properties, while thoſe mechanical properties which are peculiar to any of them, and therefore characteriſtic, have uſually been treated as an appendix to the general ſcience of pneumatics. No objection occurs to us againſt this method, which will therefore be adopted in treating this article. 4 Air the moſt familiar compreſſible fluid.

But although the mechanical properties are the proper ſubjects of our conſideration, it will be impoſſible to avoid conſidering occaſionally properties which are more of a chemical nature; becauſe they occaſion ſuch modifications of the mechanical properties as would frequently be unintelligible without conſidering them in conjunction with the other: and, on the other hand, the mechanical properties produce ſuch modifications of the properties merely chemical, and of very intereſting phenomena conſequent on them, that theſe would often paſs unexplained unleſs we give an account of them in this place. 5 Different properties of it.

By *mechanical properties* we would be underſtood to mean ſuch as produce, or are connected with, ſenſible changes of motion, and which indicate the preſence and agency of moving or mechanical powers. They are therefore the ſubject of mathematical diſcuſſion; admitting 6 Mechanical properties.

ting of meaſure, number, and direction, notions purely mathematical.

We ſhall therefore begin with the conſideration of air,

7 What is air? It is by no means an idle queſtion, "*What is this* air of which ſo much is ſaid and written?" We ſee nothing, we feel nothing. We find ourſelves at liberty to move about in any direction without any let or hinderance. Whence, then, the aſſertion, that we are ſurrounded with a *matter* called air? A few very ſimple obſervations and experiments will ſhow us that this aſſertion is well founded.

8 Proofs that it is matter, Plate CCCCXXIII. fig. 1. We are accuſtomed to ſay that a veſſel is empty when we have poured out of it the water which it contained. Take a cylindrical glaſs jar (fig. 1.) having a ſmall hole in its bottom; and having ſtopped this hole, fill the jar with water, and then pour out the water, leaving the glaſs empty, in the common acceptation of the word. Now, throw a bit of cork, or any light body, on the ſurface of water in a ciſtern: cover this with the glaſs jar A held in the hand with its bottom upwards, and move it downwards, as at B, keeping it all the while in an upright poſition. The cork will continue to float on the ſurface of the water in the inſide of the glaſs, and will moſt diſtinctly ſhow whereabouts that ſurface is. It will thus be ſeen, that the water within the glaſs has its ſurface conſiderably lower at C than that of the ſurrounding water; and however deep we immerge the glaſs, we ſhall find that the water will never riſe in the inſide of it ſo as to fill it. If plunged to the depth of 32 feet, the water will only half fill it; and yet the acknowledged laws of hydroſtatics tell us, that the water would fill the glaſs if there were nothing to hinder it. There is therefore ſomething already within the glaſs which prevents the water from getting into it; manifeſting in this manner the moſt diſtinctive property of matter, viz. the hindering other matter from occupying the ſame place at the ſame time.

9 poſſeſſed of impulſive force, While things are in this condition, pull the ſtopper D out of the hole in the bottom of the jar, and the water will inſtantly riſe in the inſide of the jar, and ſtand at an equal height within and without. This is juſtly aſcribed to the eſcape through the hole of the *matter* which formerly obſtructed the entry of the water; for if the hand be held before the hole, a puff will be diſtinctly felt, or a feather held there will be blown aſide; indicating in this manner that what prevented the entry of the water, and now eſcapes, poſſeſſes another characteriſtic property of matter, *impulſive force*. The materiality is concluded from this appearance in the ſame manner that the materiality of water is concluded from the impulſe of a jet from a pipe. We alſo ſee the mobility of the formerly pent up, and now liberated, ſubſtance, in conſequence of external preſſure, viz. the preſſure of the ſurrounding water.

10 impenetrability, Alſo, if we take a ſmooth cylindrical tube, ſhut at one end, and fit a plug or cork to its open end, ſo as to ſlide along it, but ſo tightly as to prevent all paſſage by its ſides; and if the plug be well ſoaked in greaſe, we ſhall find that no force whatever can puſh it to the bottom of the tube. There is therefore *ſomething* within the tube preventing by its impenetrability the entry of the plug, and therefore poſſeſſing this characteriſtic of matter.

11 elaſticity, In like manner, if, after having opened a pair of common bellows, we ſhut up the nozzle and valve hole, and try to bring the boards together, we find it impoſſible. There is ſomething included which prevents this, in the ſame manner as if the bellows were filled with wool; but on opening the nozzle we can eaſily ſhut them, viz. by expelling this ſomething; and if the compreſſion be forcible, the ſomething will iſſue with conſiderable force, and very ſenſibly impel any thing in its way.

It is not accurate to ſay, that we move about without *any* obſtruction: for we find, that if we endeavour to move a large fan with rapidity, a very ſenſible hinderance is perceived, and that a very ſenſible force muſt be exerted; and a ſenſible wind is produced, which will agitate the neighbouring bodies. It is therefore juſtly concluded that the motion is poſſible only in conſequence of having driven this obſtructing ſubſtance out of the way; and that this impenetrable, reſiſting, moveable, impelling ſubſtance, is *matter*. We perceive the perſeverance of this matter in its ſtate of reſt when we wave a fan, in the ſame manner that we perceive the *inertia* of water when we move a paddle through it. The effects of wind in impelling our ſhips and mills, in tearing up trees, and overturning buildings, are equal indications of its perſeverance in a ſtate of motion. 12 inertia, and mobility.

To this matter, when at reſt, we give the name Air; and when it is in motion we call it Wind.

Air, therefore, is a material fluid: a fluid, becauſe its parts are eaſily moved, and yield to the ſmalleſt inequality of preſſure. 13 It is therefore a material fluid.

Air poſſeſſes ſome others of the very general, though not eſſential, properties of matter. It is heavy. This appears from the following facts. 14 Heavy, and

1. It always accompanies this globe in its orbit round the ſun, ſurrounding it to a certain diſtance, under the name of the Atmosphere, which indicates the being connected with the earth by its general force of gravity. It is chiefly in conſequence of this that it is continually moving round the earth from eaſt to weſt; forming what is called the trade-wind, to be more particularly conſidered afterwards. All that is to be obſerved on this ſubject at preſent is, that, in conſequence of the diſturbing force of the ſun and moon, there is an accumulation of the air of the atmoſphere, in the ſame manner as of the waters of the ocean, in thoſe parts of the globe which have the moon near their zenith or nadir: and as this happens ſucceſſively, going from the eaſt to the weſt (by the rotation of the earth round its axis in the oppoſite direction), the accumulated air muſt gradually flow along to form the elevation. This is chiefly to be obſerved in the torrid zone; and the generality and regularity of this motion are greatly diſturbed by the changes which are continually taking place in different parts of the atmoſphere from cauſes which are not mechanical.

2. It is in like manner owing to the gravity of the air that it ſupports the clouds and vapours which we ſee conſtantly floating in it. We have even ſeen bodies of no inconſiderable weight float, and even riſe, in the air. Soap bubbles, and balloons filled with inflammable gas, riſe and float in the ſame manner as a cork riſes in water. This phenomenon proves the weight of the air, in the ſame manner that the ſwimming of a piece of wood indicates the weight of the water which ſupports it. 15 ſupports the clouds.

3. But we are not left to theſe refined obſervations for 16 Familiar proofs of its weight.

for the proof of the air's gravity. We may obſerve familiar phenomena, which would be immediate conſequences of the ſuppoſition that air is a heavy fluid, and, like other heavy fluids, preſſes on the outſides of all bodies immerſed in or ſurrounded by it. Thus, for inſtance, if we ſhut the nozzle and valve hole of a pair of bellows after having ſqueezed the air out of them, we ſhall find that a very great force, even ſome hundred pounds, is neceſſary for ſeparating the boards. They are kept together by the preſſure of the heavy air which ſurrounds them in the ſame manner as if they were immerſed in water. In like manner, if we ſtop the end of a ſyringe after its piſton has been preſſed down to the bottom, and then attempt to draw up the piſton, we ſhall find a conſiderable force neceſſary, viz. about 15 or 16 pounds for every ſquare inch of the ſection of the ſyringe. Exerting this force, we can draw up the piſton to the top, and we can hold it there; but the moment we ceaſe acting, the piſton ruſhes down and ſtrikes the bottom. It is called a ſuction, as we feel ſomething as it were drawing in the piſton; but it is really the weight of the incumbent air preſſing it in. And this obtains in every poſition of the ſyringe; becauſe the air is a fluid, and preſſes in every direction. Nay, it preſſes on the ſyringe as well as on the piſton; and if the piſton be hung by its ring on a nail, the ſyringe requires force to draw it down (juſt as much as to draw the piſton up); and if it be let go, it will ſpring up, unleſs loaded with at leaſt 15 pounds for every ſquare inch of its tranſverſe ſection (ſee fig. 2.).

Plate cccxxiii. fig. 2.

17
It may even be weighed.

4. But the moſt direct proof of the weight of the air is had by weighing a veſſel empty of air, and then weighing it again when the air has been admitted; and this, as it is the moſt obvious conſequence of its weight, has been aſſerted as long ago as the days of Ariſtotle. He ſays (*Περί Οὐρανοῦ*, iv. 4.), That all bodies are heavy in their place except fire; even air is heavy; for a blown bladder is heavier than when it is empty. It is ſomewhat ſurpriſing that his followers ſhould have gone into the oppoſite opinion, while profeſſing to maintain the doctrine of their leader. If we take a very large and limber bladder, and ſqueeze out the air very carefully, and weigh it, and then fill it till the wrinkles juſt begin to diſappear, and weigh it again, we ſhall find no difference in the weight. But this is not Ariſtotle's meaning; becauſe the bladder, conſidered as a veſſel, is equally full in both caſes, its dimenſions being changed. We cannot take the air out of a bladder without its immediately collapſing. But what would be true of a bladder would be equally true of any veſſel.

Fig. 3.

Therefore, take a round veſſel A (fig. 3.), fitted with a ſtopcock B, and ſyringe C. Fill the whole with water, and preſs the piſton to the bottom of the ſyringe. Then keeping the cock open, and holding the veſſel upright, with the ſyringe undermoſt, draw down the piſton. The water will follow it by its weight, and leave part of the veſſel empty. Now ſhut the cock, and again puſh up the piſton to the bottom of the ſyringe; the water eſcapes through the piſton valve, as will be explained afterward: then opening the cock, and again drawing down the piſton, more water will come out of the veſſel. Repeat this operation till all the water have come out. Shut the cock, unſcrew the ſyringe, and weigh the veſſel very accurately. Now open the cock, and admit the air, and weigh the veſſel again, it will be found heavier than before, and this additional weight is the weight of the air which fills it; and it will be found to be 523 grains, about an ounce and a fifth avoirdupois, for every cubic foot that the veſſel contains. Now ſince a cubic foot of water would weigh 1000 ounces, this experiment would ſhow that water is about 840 times heavier than air. The moſt accurate judgment of this kind of which we have met with an account is that recorded by Sir George Shuckburgh, which is in the 67th vol. of the Philoſophical Tranſactions, p. 560. From this it follows, that when the air is of the temperature 53, and the barometer ſtands at $29\frac{1}{4}$ inches, the air is 836 times lighter than water. But the experiment is not ſuſceptible of ſufficient accuracy for determining the exact weight of a cubic foot of air. Its weight is very ſmall; and the veſſel muſt be ſtrong and heavy, ſo as to overload any balance that is ſufficiently nice for the experiment.

18
The moſt convenient method of doing this.

To avoid this inconvenience, the whole may be weighed in water, firſt loading the veſſel ſo as to make it preponderate an ounce or two in the water. By this means the balance will be loaded only with this ſmall preponderancy. But even in this caſe there are conſiderable ſources of error, ariſing from changes in the ſpecific gravity of the water and other cauſes. The experiment has often been repeated with this view, and the air has been found at a medium to be about 840 times as light as water, but with great variations, as may be expected from its very heterogeneous nature, in conſequence of its being the menſtruum of almoſt every fluid, of all vapours, and even of moſt ſolid bodies; all which it holds in ſolution, forming a fluid perfectly tranſparent, and of very different denſity according to its compoſition. It is found, for inſtance, that perfectly pure air of the temperature of our ordinary ſummer is conſiderably denſer than when it has diſſolved about half as much water as it can hold in that temperature; and that with this quantity of water the difference of denſity increaſes in proportion as the maſs grows warmer, for damp air is more expanſible by heat than dry air. We have had occaſion to conſider this ſubject when treating of the connection of the mechanical properties of air with the ſtate of the weather. See METEOROLOGY.

19
This property of air denied by the Peripatetics, though acknowledged by their maſter.

Such is the reſult of the experiment ſuggeſted by Ariſtotle, evidently proving the weight of the air; and yet, as has been obſerved, the Peripatetics, who profeſs to follow the *dictates* of Ariſtotle, uniformly refuſed it this property. It was a matter long debated among the philoſophers of the laſt century. The reaſon was, that Ariſtotle, with that indiſtinctneſs and inconſiſtency, which is obſerved in all his writings which relate to matters of fact and experience, aſſigns a different cauſe to many phenomena which any man led by common obſervation would aſcribe to the weight of the air. Of this kind is the riſe of water in pumps and ſyphons, which all the Peripatetics had for ages aſcribed to ſomething which they called *nature's abhorrence of a void.* Ariſtotle had aſſerted (for reaſons not our buſineſs to adduce at preſent), that all nature was full of being, and that nature abhorred a void. He adduces many facts, in which it appears, that if not abſolutely impoſſible, it is very difficult, and requires great force, to produce a ſpace void of matter. When the operation of pumps and ſyphons came to be known, the philoſophers of Europe (who had all embraced the Peripatetic doctrines)

doctrines) found in this fancied horror of a fancied mind (what else is this that nature abhors?) a ready solution of the phenomena. We shall state the facts, that every reader may see what kinds of reasoning were received among the learned not two centuries ago.

20
Construction of pumps in the last century.
Fig. 4.

Pumps were then constructed in the following manner: A long pipe GB (fig. 4.) was set in the water of the well A. This was fitted with a sucker or piston C, having a long rod CF, and was furnished with a valve B at the bottom, and a lateral pipe DE at the place of delivery, also furnished with a valve. The fact is, that if the piston be thrust down to the bottom, and then drawn up, the water will follow it; and upon the piston being again pushed down, the water shuts the valve B by its weight, and escapes or is expelled at the valve E; and on drawing up the piston again the valve E is shut, the water again rises after the piston, and is again expelled at its next descent.

21
Their operation accounted for by the Peripatetics.

The Peripatetics explain all this by saying, that if the water did *not follow the piston* there would be a void between them. But nature abhors a void; or a void is impossible: therefore the water follows the piston.—It is not worth while to criticise the wretched reasoning in this pretence to explanation. It is all overturned by one observation. Suppose the pipe shut at the bottom, the piston *can* be drawn up, and thus a void produced. No, say the Peripatetics; and they speak of certain spirits, effluvia, &c. which occupy the place. But if so, why needs the water rise? This therefore is not the cause of its ascent. It is a curious and important phenomenon.

22
Galileo first accounted for it rationally

The sagacious Galileo seems to have been the first who seriously ascribed this to the weight of the air. Many before him had supposed air heavy; and thus explained the difficulty of raising the board of bellows, or the piston of a syringe, &c. But he distinctly applies to this allowed weight of the air all the consequences of hydrostatical laws; and he reasons as follows.

23
by the weight of the atmosphere,

The heavy air rests on the water in the cistern, and presses it with its weight. It does the same with the water in the pipe, and therefore both are on a level: but if the piston, after being in contact with the surface of the water, be drawn up, there is no longer any pressure on the surface of the water within the pipe; for the air now rests on the piston only, and thus occasions a difficulty in drawing it up. The water in the pipe, therefore, is in the same situation as if more water were poured into the cistern, that is, as much as would exert the same pressure on its surface as the air does. In this case we are certain that the water will be pressed into the pipe, and will raise up the water already in it, and follow it till it is equally high within and without. The same pressure of the air shuts the valve E during the descent of the piston. (See *Gal. Discourses*).

24
and predicted the height to which water would rise in them.

He did not wait for the very obvious objection, that if the rise of the water was the effect of the air's pressure, it would also be its measure, and would be raised and supported only to a certain height. He directly said so, and adduced this as a decisive experiment. If the horror of a void be the cause, says he, the water must rise to any height however great; but if it be owing to the pressure of the air, it will only rise till the weight of the water in the pipe is in equilibrio with the pressure of the air, according to the common laws of hydrostatics. And he adds, that this is well known; for it is a fact, that pumps will not *draw* water much above forty palms, although they may be made to *propel* it, or to *lift it* to any height. He then makes an assertion, which, if true, will be decisive. Let a very long pipe, shut at one end, be filled with water, and let it be erected perpendicularly with the close end uppermost, and a stopper in the other end, and then its lower orifice immersed into a vessel of water; the water will subside in the pipe upon removing the stopper, till the remaining column is in equilibrio with the pressure of the external air. This experiment he proposes to the curious; saying, however, that he thought it unnecessary, there being already such abundant proofs of the air's pressure.

25
His prediction verified by Toricelli's experiment.

It is probable that the cumbersomeness of the necessary apparatus protracted the making of this experiment. Another equally conclusive, and much easier, was made in 1642 after Galileo's death, by his zealous and learned disciple Toricelli. He filled a glass tube, close at one end, with mercury; judging, that if the support of the water was owing to the pressure of the air, and was the measure of this pressure, mercury would in like manner be supported by it, and this at a height which was also the measure of the air's pressure, and therefore 13 times less than water. He had the pleasure of seeing his expectation verified in the completest manner; the mercury descending in the tube AB (fig. 5.), and finally settling at the height *f*B of 29½ Roman inches: and he found, that when the tube was inclined, the point *f* was in the same horizontal plane with *f* in the upright tube, according to the received laws of hydrostatical pressure. The experiment was often repeated, and soon became famous, exciting great controversies among the philosophers about the possibility of a vacuum. About three years afterwards the same experiment was published, at Warsaw in Poland, by Valerianus Magnus, as his own suggestion and discovery: but it appears plain from the letters of Roberval, not only that Toricelli was prior, and that his experiment was the general topic of discussion among the curious; but also highly probable that Valerianus Magnus was informed of it when at Rome, and daily conversant with those who had seen it. He denies, however, even having heard of the name of Toricelli. Fig. 5.

26
Origin of the Royal Society, &c.

This was the era of philosophical ardour; and we think that it was Galileo's invention and immediate application of the telescope which gave it vigour. Discoveries of the most wonderful kind in the heavens, and which required no extent of previous knowledge to understand them, were thus put into the hands of every person who could purchase a spy-glass; while the high degree of credibility which some of the discoveries, such as the phases of Venus and the rotation and satellites of Jupiter, gave to the Copernican system, immediately set the whole body of the learned in motion. Galileo joined to his ardour a great extent of learning, particularly of mathematical knowledge and sound logic, and was even the first who formally united mathematics with physics; and his treatise on accelerated motion was the first, and a precious fruit of this union. About the years 1642 and 1644, we find clubs of gentlemen associated in Oxford and London for the cultivation of knowledge by experiment; and before 1655 all the doctrines of hydrostatics and pneumatics were familiar there, established upon experiment. Mr Boyle procured a coalition and correspondence of these clubs under the name of the Invisible and Philosophical Society. In May 1658, Mr Hooke finished for Mr Boyle

27 Invention of the air-pump.

Boyle an air-pump, which had employed him a long time, and occaſioned him ſeveral journeys to London for things which the workmen of Oxford could not execute. He ſpeaks of this as a great improvement on Mr Boyle's own pump, which he had been uſing ſome time before. Boyle therefore muſt have invented his air-pump; and was not indebted for it to Schottus's account of Otto Guerick's, publiſhed in his (Schottus) *Mechanica Hydraulo-pneumatica* in 1657, as he aſſerts (*Techna Curioſa*). The Royal Society of London aroſe in 1656 from the coalition of theſe clubs, after 15 years co-operation and correſpondence. The Montmorine Society at Paris had ſubſiſted nearly about the ſame time; for we find Paſchal in 1648 ſpeaking of the meetings in the Sorbonne College, from which we know that ſociety originated.—Nuremberg, in Germany, was alſo a diſtinguiſhed ſeminary of experimental philoſophy. The magiſtrates, ſenſible of its valuable influence in many manufactures, the ſource of the opulence and proſperity of their city, and many of them philoſophers, gave philoſophy a profeſſed and munificent patronage, furniſhing the philoſophers with a copious apparatus, a place of aſſembly, and a fund for the expence of their experiments; ſo that this was the firſt academy of ſciences out of Italy under the patronage of government. In Italy, indeed, there had long exiſted inſtitutions of this kind.

28 The experiments of Galileo and Toricelli rapidly diffuſed.

Rome was the centre of church-government, and the reſort of all expectants for preferment. The clergy was the majority of the learned in all Chriſtian nations, and particularly of the ſyſtematic philoſophers. Each, eager to recommend himſelf to notice, brought forward every thing that was curious; and they were the willing vehicles of philoſophical communication. Thus the experiments of Galileo and Toricelli were rapidly diffuſed by perſons of rank, the dignitaries of the church, or by the monks their obſequious ſervants. Perhaps the recent defection of England, and the want of a reſiding embaſſy at Rome, made her ſometimes late in receiving or ſpreading philoſophical reſearches, and was the cauſe that more was done there *proprio Marte*.

29 The merit of Toricelli's claimed by others

We hope to be excuſed for this digreſſion. We were naturally led into it by the pretenſions of Valerianus Magnus to originality in the experiment of the mercury ſupported by the preſſure of the air. Such is the ſtrength of national attachment, that there were not wanting ſome who found that Toricelli had borrowed his experiment from Honoratus Fabri, who had propoſed and explained it in 1641: but whoever knows the writings of Toricelli, and Galileo's high opinion of him, will never think that he could need ſuch helps. (See this ſurmiſe of Mounier in *Schott. Tech. Cur.* III. at the end).

Galileo muſt be conſidered as the author of the experiment when he propoſes it to be made. Valerianus Magnus owns himſelf indebted to him for the principle and the contrivance of the experiment. It is neither wonderful that many ingenious men, of one opinion, and inſtructed by Galileo, ſhould ſeparately hit on ſo obvious a thing; nor that Toricelli, his immediate diſciple, his enthuſiaſtic admirer, and who was in the habits of correſponding with him till his death in 1642, ſhould be the firſt to put it in practice. It became the ſubject of diſpute from the national arrogance and ſelf-conceit of ſome Frenchmen, who have always ſhown themſelves diſpoſed to conſider their nation as at the head of the republic of letters, and cannot brook the concurrence of any foreigners. Roberval was in this inſtance, however, the champion of Toricelli; but thoſe who know his controverſies with the mathematicians of France at this time will eaſily account for this exception.

30 unjuſtly.

All now agree in giving Toricelli the honour of the *firſt* invention; and it univerſally paſſes by the name of the TORICELLIAN EXPERIMENT. The tube is called the TORICELLIAN TUBE; and the ſpace left by the mercury is called the TORICELLIAN VACUUM, to diſtinguiſh it from the BOYLEAN VACCUM, which is only an extreme rarefaction.

31 It was repeated in various forms.

The experiment was repeated in various forms, and with apparatus which enabled philoſophers to examine ſeveral effects which the vacuum produced on bodies expoſed in it. This was done by making the upper part of the tube terminate in a veſſel of ſome capacity, or communicate with ſuch a veſſel, in which were included along with the mercury bodies on which the experiments were to be made. When the mercury had run out, the phenomena of theſe bodies were carefully obſerved.

32 An objection to the concluſion drawn from it obviated.

An objection was made to the concluſion drawn from Toricelli's experiment, which appears formidable. If the Toricellian tube be ſuſpended on the arm of a balance, it is found that the counterpoiſe muſt be equal to the weight both of the tube and of the mercury it contains. This could not be, ſay the objectors, if the mercury were ſupported by the air. It is evidently ſupported by the balance; and this gave riſe to another notion of the cauſe different from the peripatetic *fuga vacui*: a ſuſpenſive force, or rather attraction, was aſſigned to the upper part of the tube.

But the true explanation of the phenomenon is moſt eaſy and ſatisfactory. Suppoſe the mercury in the ciſtern and tube to freeze, but without adhering to the tube, ſo that the tube could be freely drawn up and down. In this caſe the mercury is ſupported by the baſe, without any dependence on the preſſure of the air; and the tube is in the ſame condition as before, and the ſolid mercury performs the office of a piſton to this kind of ſyringe. Suppoſe the tube thruſt down till the top of it touches the top of the mercury. It is evident that it muſt be drawn up in oppoſition to the preſſure of the external air, and it is preciſely ſimilar to the ſyringe mentioned in N° 16. The weight ſuſtained therefore by this arm of the balance is the weight of the tube and the downward preſſure of the atmoſphere on its top.

33 Galileo's original experiment performed.

The curioſity of philoſophers being thus excited by this very manageable experiment, it was natural now to try the original experiment propoſed by Galileo. Accordingly Berti in Italy, Paſchal in France, and many others in different places, made the experiment with a tube filled with water, wine, oil, &c. and all with the ſucceſs which might be expected in ſo ſimple a matter: and hence the doctrine of the weight and preſſure of the air was eſtabliſhed beyond contradiction or doubt. All this was done before the year 1648.—A very beautiful experiment was exhibited by Auzout, which completely ſatisfied all who had any remaining doubts.

34 An experiment by Auzout Fig. 6.

A ſmall box or phial EFGH (fig. 6.) had two glaſs tubes, AB, CD, three feet long, inſerted into it in ſuch a manner as to be firmly fixed in one end, and to reach nearly to the other end. AB was open at both ends, and CD was cloſe at D. This apparatus was completely filled with mercury, by unſcrewing the tube AB, filling

ſing the box, and the tube CD; then ſcrewing in the tube AB, and filling it: then holding a finger on the orifice A, the whole was inverted and ſet upright in the poſition repreſented in figure *β*, immerſing the orifice A (now *a* of fig. *β*.) in a ſmall veſſel of quickſilver. The reſult was, that the mercury ran out at the orifice *a*, till its ſurface *m n* within the phial deſcended to the top of the tube *b a*. The mercury alſo began to deſcend in the tube *d c* (formerly DC) and run over into the tube *b a*, and run out at *a*, till the mercury in *d c* was very near equal in a level with *m n*. The mercury deſcending in *b a* till it ſtood at *k*, 29½ inches above the ſurface *o p* of the mercury in the ciſtern, juſt as in the Toricellian tube.

The rationale of this experiment is very eaſy. The whole apparatus may firſt be conſidered as a Toricellian tube of an uncommon ſhape, and the mercury would flow out at *a*. But as ſoon as a drop of mercury comes out, leaving a ſpace above *m n*, there is nothing to keep up the mercury in the tube *d c*. Its mercury therefore deſcends alſo; and running over into *b a*, continues to ſupply its expence till the tube *d c* is almoſt empty, or can no longer ſupply the waſte of *b a*. The inner ſurface therefore falls as low as it can, till it is level with *b*. No more mercury can enter *b a*, yet its column is too heavy to be ſupported by the preſſure of the air on the mercury in the ciſtern below; it therefore deſcends in *b a*, and finally ſettles at the height *h o*, equal to that of the mercury in the Toricellian tube.

35
decisive of the queſtion.

The prettieſt circumſtance of the experiment remains. Make a ſmall hole *g* in the upper cap of the box. The external air immediately ruſhes in by its weight, and now preſſes on the mercury in the box. This immediately raiſes the mercury in the tube *d c* to *l*, 29½ inches above *m n*. It preſſes on the mercury at *k* in the tube *b a*, balancing the preſſure of the air in the ciſtern. The mercury in the tube therefore is left to the influence of its own weight, and it deſcends to the bottom. Nothing can be more appoſite or deciſive.

36
The gravity of the air therefore a ſtatical principle from which we obtain

And thus the doctrine of the gravity and preſſure of the air is eſtabliſhed by the moſt unexceptionable evidence: and we are intitled to aſſume it as a ſtatical principle, and to affirm *à priori* all its legitimate conſequences.

37
an exact meaſure of the preſſure of the atmoſphere.

And in the firſt place, we obtain an exact meaſure of the preſſure of the atmoſphere. It is preciſely equal to the weight of the column of mercury, of water, of oil, &c. which it can ſupport; and the Toricellian tube, or others fitted up upon the ſame principle, are juſtly termed *baroſcopes* and *barometers* with reſpect to the air. Now it is obſerved that water is ſupported at the height of 32 feet nearly: the weight of the column is exactly 2000 avoirdupois pounds on every ſquare foot of baſe, or $13\frac{9}{10}$ on every ſquare inch. The ſame concluſion very nearly may be drawn from the column of mercury, which is nearly 29½ inches high when in equilibrium with the preſſure of the air. We may here obſerve, that the meaſure taken from the height of a column of water, wine, ſpirits, and the other fluids of conſiderable volatility, as chemiſts term it, is not ſo exact as that taken from mercury, oil, and the like. For it is obſerved, that the volatile fluids are converted by the ordinary heat of our climates into vapour when the confining preſſure of the air is removed; and this vapour, by its elaſticity, exerts a ſmall preſſure on the ſurface of the water, &c. in the pipe, and thus counteracts a ſmall part of the external preſſure; and therefore the column ſupported by the remaining preſſure muſt be lighter, that is, ſhorter. Thus it is found, that rectified ſpirits will not ſtand much higher than is competent to a weight of 13 pounds on an inch, the elaſticity of its vapour balancing about $\frac{2}{15}$ of the preſſure of the air. We ſhall afterwards have occaſion to conſider this matter more particularly.

As the medium height of the mercury in the barometer is 29½ inches, we ſee that the whole globe ſuſtains a preſſure equal to the whole weight of a body of mercury of this height; and that all bodies on its ſurface ſuſtain a part of this in proportion to their ſurfaces. An ordinary ſized man ſuſtains a preſſure of ſeveral thouſand pounds. How comes it then that we are not ſenſible of a preſſure which one ſhould think enough to cruſh us together? This has been conſidered as a ſtrong objection to the preſſure of the air; for when a man is plunged a few feet under water, he is very ſenſible of the preſſure.

38
A difficulty ſolved.

The anſwer is by no means ſo eaſy as is commonly imagined. We feel very diſtinctly the effects of removing this preſſure from any part of the body. If any one will apply the open end of a ſyringe to his hand, and then draw up the piſton, he will find his hand ſucked into the ſyringe with great force, and it will give pain; and the ſoft part of the hand will ſwell into it, being preſſed in by the neighbouring parts, which are ſubject to the action of the external air. If one lays his hand on the top of a long perpendicular pipe, ſuch as a pump filled to the brim with water, which is at firſt prevented from running out by the valve below; and if the valve be then opened, ſo that the water deſcends, he will then find his hand ſo hard preſſed to the top of the pipe that he cannot draw it away. But why do we only feel the *inequality* of preſſure? There is a ſimilar inſtance wherein we do not feel it, although we cannot doubt of its exiſtence. When a man goes ſlowly to a great depth under water in a diving-bell, we know unqueſtionably that he is expoſed to a new and very great preſſure, yet he does not feel it. But thoſe facts are not ſufficiently familiar for general argument. The human body is a bundle of ſolids, hard or ſoft, filled or mixed with fluids, and there are few or no parts of it which are empty. All communicate either by veſſels or pores; and the whole ſurface is a ſieve through which the inſenſible perſpiration is performed. The whole extended ſurface of the lungs is open to the preſſure of the atmoſphere; every thing is therefore in equilibrio: and if free or ſpeedy acceſs be given to every part, the body will not be damaged by the preſſure, however great, any more than a wet ſponge would be deranged by plunging it any depth in water. The preſſure is inſtantaneouſly diffuſed by means of the incompreſſible fluids with which the parts are filled; and if any parts are filled with air or other compreſſible fluids, theſe are compreſſed till their elaſticity again balances the preſſure. Beſides, all our fluids are acquired ſlowly, and gradually mixed with that proportion of air which they can diſſolve or contain. The whole animal has grown up in this manner from the firſt vital atom of the embryo. For ſuch reaſons the preſſure can occaſion no change of ſhape by ſqueezing together the flexible parts; nor any obſtruction by compreſſing the veſſels or pores. We cannot ſay what would be felt by a man, were it poſſible that he could have been produced

duced and grown up *in vacuo*, and then fubjected to the compreffion. We even know that any fudden and confiderable change of general preffure is very feverely felt. Perfons in a diving-bell have been almoft killed by letting them down or drawing them up too fuddenly. In drawing up, the elaftic matters within have fuddenly fwelled, and not finding an immediate efcape have burft the veffels. Dr Halley experienced this, the blood gufhing out from his ears by the expanfion of air contained in the internal cavities of this organ, from which there are but very flender paffages.

39 The weather-glafs.

A very important obfervation recurs here: the preffure of the atmofphere is variable. This was obferved almoft as foon as philofophers began to attend to the barometer. Pafchal obferved it in France, and Defcartes obferved it in Sweden in 1650. Mr Boyle and others obferved it in England in 1656. And before this, obfervers, who took notice of the concomitancy of thefe changes of aerial preffure with the ftate of the atmofphere, remarked, that it was generally greateft in winter and in the night; and certainly moft variable during winter and in the northern regions. Familiar now with the weight of the air, and confidering it as the vehicle of the clouds and vapours, they noted with care the connection between the weather and the preffure of the air, and found that a great preffure of the air was generally accompanied with fair weather, and a diminution of it with rain and mifts. Hence the barometer came to be confidered as an index not only of the prefent ftate of the air's weight, but alfo as indicating by its variations changes of weather. It became a WEATHER-GLASS, and continued to be anxioufly obferved with this view. This is an important fubject, and in another place is treated in fome detail.

40 The preffure of the air in proportion to the elevation

In the next place, we may conclude that the preffure of the air will be different in different places, according to their elevation above the furface of the ocean: for if air be an heavy fluid, it muft prefs in fome proportion according to its perpendicular height. If it be a homogeneous fluid of equal denfity and weight in all its parts, the mercury in the ciftern of a barometer muft be preffed precifely in proportion to the depth to which that ciftern is immerfed in it; and as this preffure is exactly meafured by the height of the mercury in the tube, the height of the mercury in the Toricellian tube muft be exactly proportional to the depth of the place of obfervation under the furface of the atmofphere.

41 firft fuppofed by Defcartes and Pafchal, and proved by experiments,

The celebrated Defcartes firft entertained this thought (Epift. 67. of Pr. III.) and foon after him Pafchal. His occupation in Paris not permitting him to try the juftnefs of his conjecture, he requefted Mr Perrier a gentleman of Clermont in Auvergne, to make the experiment, by obferving the height of the mercury at one and the fame time at Clermont and on the top of a very high mountain in the neighbourhood. His letters to Mr Perrier in 1647 are ftill extant. Accordingly Mr Perrier, in September 1648, filled two equal tubes with mercury, and obferved the heights of both to be the fame, viz. $26\frac{3}{12}$ inches, in the garden of the convent of the Friars Minims, fituated in the loweft part of Clermont. Leaving one of them there, and one of the fathers to obferve it, he took the other to the top of Puy de Domme, which was elevated nearly 500 French fathoms above the garden. He found its height to be $23\frac{2}{12}$ inches. On his return to the town, in a place called *Font de l'Arbre*, 150 fathoms above the garden, he found it 25 inches; when he returned to the garden it was again $26\frac{3}{12}$, and the perfon fet to watch the tube which had been left faid that it had not varied the whole day. Thus a difference of elevation of 3000 French feet had occafioned a depreffion of $3\frac{1}{3}$ inches; from which it may be concluded, that $3\frac{1}{3}$ inches of mercury weighs as much as 3000 feet of air, and one-tenth of an inch of mercury as much as 96 feet of air. The next day he found, that taking the tube to the top of a fteeple 120 feet high made a fall of one-fixth of an inch. This gives 72 feet of air for one-tenth of an inch of mercury; but ill agreeing with the former experiment. But it is to be obferved, that a very fmall error of obfervation of the barometer would correfpond to a great difference of elevation, and alfo that the height of the mountain had not been meafured with any precifion. This has been fince done (Mem. Acad. par. 1703), and found to be 529 French toifes.

42 which were repeated by others.

Pafchal publifhed an account of this great experiment (*Grande Exp. fur la Pefanteur de l'Air*), and it was quickly repeated in many places of the world. In 1653 it was repeated in England by Dr Power (Power's Exper. Phil.); and in Scotland, in 1661, by Mr Sinclair profeffor of philofophy in the univerfity of Glafgow, who obferved the barometer at Lanark, on the top of Mount Tinto in Clydefdale, and on the top of Arthur's Seat at Edinburgh. He found a depreffion of two inches between Glafgow and the top of Tinto, three quarters of an inch between the bottom and top of Arthur's Seat, and $\frac{1}{10}$ of an inch at the cathedral of Glafgow on a height of 126 feet. See Sinclair's *Ars Nova et Magna Gravitatis et Levitatis*; *Sturmii Collegium Experimentale*, and *Schotti Technica Curiofa*.

43 Hence a method of meafuring heights.

Hence we may derive a method of meafuring the heights of mountains. Having afcertained with great precifion the elevation correfponding to a fall of one-tenth of an inch of mercury, which is nearly 90 feet, we have only to obferve the length of the mercurial column at the top and bottom of the mountain, and to allow 90 feet for every tenth of an inch. Accordingly this method has been practifed with great fuccefs; but it requires an attention to many things not yet confidered; fuch as the change of denfity of the mercury by heat and cold; the changes of denfity of air, which are much more remarkable from the fame caufes; and above all, the changes of the denfity of air from its compreffibility; a change immediately connected with or dependent on the very elevation we wifh to meafure. Of all thefe afterwards.

44 Alfo a meafure of the denfity of the air.

Thefe obfervations give us the moft accurate meafure of the denfity of air and its fpecific gravity. This is but vaguely though directly meafured by weighing air in a bladder or veffel. The weight of a manageable quantity is fo fmall, that a balance fufficiently ticklifh to indicate even very fenfible fractions of it is overloaded by the weight of the veffel which contains it, and ceafes to be exact: and when we take Bernouilli's ingenious method of fufpending it in water, we expofe ourfelves to great rifk of error by the variation of the water's denfity. Alfo it muft neceffarily be humid air which we can examine in this way: but the proportion of an elevation in the atmofphere to the depreffion of the column of mercury or other fluid, by which we meafure its preffure, gives us at once the proportion of this weight

weight or their ſpecific gravity. Thus ſince it is found that in ſuch a ſtate of preſſure the barometer ſtands at 30 inches, and the thermometer at 32°, 87 feet of riſe produces one-tenth of an inch of fall in the barometer, the air and the mercury being both of the freezing temperature, we muſt conclude that mercury is 10,440 times heavier or denſer than air. Then, by comparing mercury and water, we get $\frac{1}{801}$ nearly for the denſity of air relative to water: but this varies ſo much by heat and moiſture, that it is uſeleſs to retain any thing more than a general notion of it; nor is it eaſy to determine whether this method or that by actual weighing be preferable. It is extremely difficult to obſerve the height of the mercury in the barometer nearer than $\frac{1}{100}$ of an inch; and this will produce a difference of even five feet, or $\frac{1}{15}$ of the whole. Perhaps this is a greater proportion than the error in weighing.

45 and ſome knowledge of the height of the atmoſphere.

From the ſame experiments we alſo derive ſome knowledge of the height of the aerial covering which ſurrounds our globe. When we raiſe our barometer 87 feet above the ſurface of the ſea, the mercury falls about one-tenth of an inch in the barometer: therefore if the barometer ſhows 30 inches at the ſea-ſhore, we may expect that, by raiſing it 300 times 87 feet, or 5 miles, the mercury in the tube will deſcend to the level of the ciſtern, and that this is the height of our atmoſphere. But other appearances lead us to ſuppoſe a much greater height. Meteors are ſeen with us much higher than this, and which yet give undoubted indication of being ſupported by our air. There can be little doubt, too, that the viſibility of the expanſe above us is owing to the reflection of the ſun's light by our air. Were the heavenly ſpaces perfectly tranſparent, we ſhould no more ſee them than the pureſt water through which we ſee other objects; and we ſee *them* as we ſee water tinged with milk or other fæculæ. Now it is eaſy to ſhow, that the light which gives us what is called twilight muſt be reflected from the height of at leaſt 50 miles; for we have it when the ſun is depreſſed 18 degrees below our horizon.

46 Why this knowledge is not accurate.

A little attention to the conſtitution of our air will convince us, that the atmoſphere muſt extend to a much greater height than 300 times 87 feet. We ſee from the moſt familiar facts that it is compreſſible; we can ſqueeze it in an ox-bladder. It is alſo heavy; preſſing on the air in this bladder with a very great force, not leſs than 1500 pounds. We muſt therefore conſider it as in a ſtate of compreſſion, exiſting in ſmaller room than it would aſſume if it were not compreſſed by the incumbent air. It muſt therefore be in a condition ſomething reſembling that of a quantity of fine carded wool thrown looſely into a deep pit; the lower ſtrata carrying the weight of the upper ſtrata, and being compreſſed by them; and ſo much the more compreſſed as they are further down, and only the upper ſtratum in its unconſtrained and moſt expanded ſtate. If we ſhall ſuppoſe this wool thrown in by a hundred weight at a time, it will be divided into ſtrata of equal weights, but of unequal thickneſs: the loweſt being the thinneſt, and the ſuperior ſtrata gradually increaſing in thickneſs. Now, ſuppoſe the pit filled with air, and reaching to the top of the atmoſphere, the *weights* of all the ſtrata above any horizontal plane in it is meaſured by the height of the mercury in the Toricellian tube placed in that plane; and one-tenth of an inch of mercury is juſt equal to the weight of the loweſt ſtratum 87 feet thick: for on raiſing the tube 87 feet from the ſea, the ſurface of the mercury will deſcend one-tenth of an inch. Raiſe the tube till the mercury fall another tenth; This ſtratum muſt be more than 87 feet thick; how much more we cannot tell, being ignorant of the law of the air's expanſion. In order to make it fall a third tenth, we muſt raiſe it through a ſtratum ſtill thicker; and ſo on continually.

All this is abundantly confirmed by the very firſt experiment made by the order and directions of Paſchal: For by carrying the tube from the garden of the convent to a place 150 fathoms higher, the mercury fell $1\frac{7}{24}$ inches, or 1.2916; which gives about 69 feet 8 inches of aerial ſtratum for $\frac{1}{10}$ of an inch of mercury; and by carrying it from thence to a place 350 fathoms higher, the mercury fell $1\frac{11}{12}$, or 1.9167 inches, which gives 109 feet 7 inches for $\frac{1}{10}$ of an inch of mercury. Theſe experiments were not accurately made; for at that time the philoſophers, though zealous, were but *ſcholars* in the *ſcience* of experimenting, and novices in the art. But the reſults abundantly ſhow this general truth, and they are completely confirmed by thouſands of ſubſequent obſervations. It is evident from the whole tenor of them, that the ſtrata of air decreaſe in denſity as we aſcend through the atmoſphere; but it remained to be diſcovered what is the force of this decreaſe, that is, the law of the air's expanſion. Till this be done we can ſay nothing about the conſtitution of our atmoſphere: we cannot tell in what manner it is fitteſt for raiſing and ſupporting the exhalations and vapours which are continually ariſing from the inhabited regions; not as an excrementitious waſte, but to be ſupported, perhaps manufactured, in that vaſt laboratory of nature, and to be returned to us in beneficent ſhowers. We cannot uſe our knowledge for the curious, and frequently uſeful, purpoſe of meaſuring the heights of mountains and taking the levels of extenſive regions; in ſhort, without an accurate knowledge of this, we can hardly acquire any acquaintance with thoſe mechanical properties which diſtinguiſh air from thoſe liquids which circulate here below.

47 Compreſſibility of the air.

Having therefore conſidered at ſome length the leading conſequences of the air's fluidity and gravity, let us conſider its compreſſibility with the ſame care; and then, combining the agency of both, we ſhall anſwer all the purpoſes of philoſophy, diſcover the laws, explain the phenomena of nature, and improve art. We proceed therefore to conſider a little the phenomena which indicate and characteriſe this other property of the air. All fluids are elaſtic and compreſſible as well as air; but in them the compreſſibility makes no figure, or does not intereſt us while we are conſidering their preſſures, motions, and impulſions. But in air the compreſſibility and expanſion draw our chief attention, and make it a proper repreſentative of this claſs of fluids.

48 A familiar phenomenon, which

Nothing is more familiar than the compreſſibility of air. It is ſeen in a bladder filled with it, which we can forcibly ſqueeze into leſs room; it is ſeen in a ſyringe, of which we can puſh the plug farther and farther as we increaſe the preſſure.

49 ſhews its elaſticity.

But theſe appearances bring into view another, and the moſt intereſting, property of air, viz. its *elaſticity*. When we have ſqueezed the air in the bladder or ſyringe into leſs room, we find that the force with which we *compreſſed* it is neceſſary to *keep it in this bulk*; and that

that if we ceaſe to preſs it together, it will ſwell out and regain its natural dimenſions. This diſtinguiſhes it eſſentially from ſuch a body as a maſs of flour, ſalt, or ſuch like, which remain in the compreſſed ſtate to which we reduce them.

50 Reſiſting force, and producing motion.

There is ſomething therefore which oppoſes the compreſſion different from the ſimple impenetrability of the air: there is ſomething that oppoſes mechanical force: there is ſomething too which produces motion, not only reſiſting compreſſion, but puſhing back the compreſſing body, and communicating motion to it. As an arrow is gradually accelerated by the bow ſtring preſſing it forward, and at the moment of its diſcharge is brought to a ſtate of rapid motion; ſo the ball from a pop-gun or wind-gun is gradually accelerated along the barrel by the preſſure of the air during its expanſion from its compreſſed ſtate, and finally quits it with an accumulated velocity. Theſe two motions are indications perfectly ſimilar of the elaſticity of the bow and of the air.

51 Fluidity of the air.

Thus it appears that air is heavy and elaſtic. It needs little conſideration to convince us in a vague manner that it is fluid. The eaſe with which it is penetrated, and driven about in every direction, and the motion of it in pipes and channels, however crooked and intricate, entitle it to this character. But before we can proceed to deduce conſequences from its fluidity, and to offer them as a true account of what will happen in theſe circumſtances, it is neceſſary to exhibit ſome diſtinct and ſimple caſe, in which the characteriſtic mechanical property of a fluid is clearly and unequivocally obſerved in it. That property of fluids from which all the laws of hydroſtatics and hydraulics are derived with ſtricteſt evidence is, that any preſſure applied to any part of them is propagated through the whole maſs in every direction; and that in conſequence of this diffuſion of preſſure, any two external forces can be put in equilibrio by the interpoſition of a fluid, in the ſame way as they can be put in equilibrio by the intervention of any mechanical engine.

52 Experimentally Fig. 7.

Let a cloſe veſſel ABC (fig. 7.), of any form, have two upright pipes EDC, GFB, inſerted into any parts of its top, ſides, or bottom, and let water be poured into them, ſo as to ſtand in equilibrio with the horizontal ſurface at E, D, G, F, and let D *d*, F *f*, be horizontal lines, *it will be found* that the height of the column E *d* is ſenſibly equal to that of the column G *f*. This is a fact univerſally obſerved in whatever way the pipes are inſerted.

53 proved.

Now the ſurface of the water at D is undoubtedly preſſed upwards with a force equal to a column of water, having its ſurface for its baſe, and E *d* for its height; it is therefore prevented from riſing by ſome oppoſite force. This can be nothing but the elaſticity of the confined air preſſing it down. The very ſame thing muſt be ſaid of the ſurface at F; and thus there are two external preſſures at D and F ſet in equilibrio by the interpoſition of air. The force exerted on the ſurface D, by the preſſure of the column E *d*, is therefore propagated to the ſurface at F: and thus air has this characteriſtic mark of fluidity.

In this experiment the *weight* of the air is inſenſible when the veſſel is of ſmall ſize, and has no ſenſible ſhare in the preſſure reaching at D and F. But if the elevation of the point F above D is very great, the column E *d will be obſerved* ſenſibly to exceed the column G *f*. Thus if F be 70 feet higher than D, E *d* will be an inch longer than the column G *f*: for in this caſe there is reacting at D, not only the preſſure propagated from F, but alſo the weight of a column of air, having the ſurface at D for its baſe and 70 feet high. This is equal to the weight of a column of water one inch high.

It is by this propagation of preſſure, this *fluidity*, that the pellet is diſcharged from a child's pop gun. It ſticks faſt in the muzzle; and he forces in another pellet at the other end, which he preſſes forward with the rammer, condenſing the air between them, and thus propagating to the other pellet the preſſure which he exerts, till the friction is overcome, and the pellet is diſcharged by the air expanding and following it.

There is a pretty philoſophical plaything which illuſtrates this property of air in a very perſpicuous manner, and which we ſhall afterwards have occaſion to conſider as converted into a moſt uſeful hydraulic machine. 54 This is what is uſually called *Hero's fountain*, having Hero's been invented by a Syracuſan of that name. It con- fountain. ſiſts of two veſſels KLMN (fig. 8.), OPQR, which are Fig. 8. cloſe on all ſides. The tube AB, having a funnel a-top, paſſes through the uppermoſt veſſel without communicating with it, being ſoldered into its top and bottom. It alſo paſſes through the top of the under veſſel, where it is alſo ſoldered, and reaches almoſt to its bottom. This tube is open at both ends. There is another open tube ST, which is ſoldered into the top of the under veſſel and the bottom of the upper veſſel, and reaches almoſt to its top. Theſe two tubes ſerve alſo to ſupport the upper veſſel. A third tube GF is ſoldered into the top of the upper veſſel, and reaches almoſt to its bottom. This tube is open at both ends, but the orifice G is very ſmall. Now ſuppoſe the uppermoſt veſſel filled with water to the height EN, E *e* being its ſurface a little below T. Stop the orifice G with the finger, and pour in water at A. This will deſcend through AB, and compreſs the air in OPQR into leſs room. Suppoſe the water in the under veſſel to have acquired the ſurface C *c*, the air which formerly occupied the whole of the ſpaces OPQR, and KL *e* E, will now be contained in the ſpaces *o* P *c* C and KL *e* E; and its elaſticity will be in equilibrio with the weight of the column of water, whoſe baſe is the ſurface E *e*, and whoſe height is A *c*. As this preſſure is exerted in every part of the air, it will be exerted on the ſurface E *e* of the water of the upper veſſel, and if the pipe FG were continued upwards, the water would be ſupported in it to an height *e* H above E *e*, equal to A *c*. Therefore if the finger be now taken from off the orifice G, the water will ſpout up to the ſame height as if it had been immediately forced out by a column of water A *c* without the intervention of the air, that is, nearly to H. If inſtead of the funnel at A, the veſſel have a brim VW which will cauſe the water diſcharged at G to run down the pipe AB, this fountain will play till all the water in the upper veſſel is expended. The operation of this ſecond fountain will be better underſtood from fig. 9. which an intelligent reader will ſee is per- Fig. 9. fectly equivalent to fig. 8. A very powerful engine for raiſing water upon this principle has long been employed in the Hungarian mines; where the pipe AB is about 200 feet high, and the pipe FG about 120; and the condenſation is made in the upper veſſel, and communicated

cated to the lower, at the bottom of the mine, by a long pipe. See *WATER-Works*.

55 Laws of hydroſtatics applicable to air.

We may now apply to air all the laws of hydroſtatics and hydraulics, in perfect confidence that their legitimate conſequences will be obſerved in all its ſituations. We ſhall in future ſubſtitute, in place of any force acting on a ſurface of air, a column of water, mercury, or any other fluid whoſe weight is equal to this force: and as we know diſtinctly from theory what will be the conſequences of this hydroſtatic preſſure, we ſhall determine *à priori* the phenomena in air; and in caſes where theory does not enable us to ſay with preciſion what is the effect of this preſſure, experience informs us in the caſe of water, and analogy enables us to transfer this to air. We ſhall find this of great ſervice in ſome caſes, which otherwiſe are almoſt deſperate in the preſent ſtate of our knowledge.

56 More refined experiments, ſuch as

From ſuch familiar and ſimple obſervations and experiments, the fluidity, the heavineſs, and elaſticity, are diſcovered of the ſubſtance with which we are ſurrounded, and which we call *air*. But to underſtand theſe properties, and completely to explain their numerous and important conſequences, we muſt call in the aid of more refined obſervations and experiments, which even this ſcanty knowledge of them enables us to make; we muſt contrive ſome methods of producing with preciſion any degree of condenſation or rarefaction, of employing or excluding the gravitating preſſure of air, and of modifying at pleaſure the action of all its mechanical properties.

57 a method of compreſſing the air by Plate CCCCXXXIV. fig. 10.

Nothing can be more obvious than a method of compreſſing a quantity of air to any degree. Take a cylinder or priſmatic tube AB (fig. 10.) ſhut at one end, and fit it with a piſton or plug C, ſo nicely that no air can paſs by its ſides. This will be beſt done in a cylindric tube by a turned ſtopper, covered with oiled leather, and fitted with a long handle CD. When this is thruſt down, the air which formerly occupied the whole capacity of the tube is *condenſed* into leſs room. The force neceſſary to produce any degree of compreſſion may be concluded from the weight neceſſary for puſhing down the plug to any depth. But this inſtrument leaves us little opportunity of making intereſting experiments on or in this condenſed air; and the force required to make any degree of compreſſion cannot be meaſured with much accuracy; becauſe the piſton muſt be very cloſe, and have great friction, in order to be ſufficiently tight: And as the compreſſion is increaſed, the leather is more ſqueezed to the ſide of the tube; and the proportion of the external force, which is employed merely to overcome this variable and uncertain friction, cannot be aſcertained with any tolerable preciſion. To get rid of theſe imperfections, the following addition may be made to the inſtrument, which then becomes what is called the *condenſing ſyringe*.

58 the condenſing ſyringe with

The end of the ſyringe is perforated with a very ſmall hole *ef*; and being externally turned to a ſmall cylinder, a narrow ſlip of bladder, or of thin leather; ſoaked in a mixture of oil and tallow, muſt be tied over the hole. Now let us ſuppoſe the piſton puſhed down to the bottom of the barrel to which it applies cloſe; when it is drawn up to the top, it leaves a void behind, and the weight of the external air preſſes on the ſlip of bladder, which therefore claps cloſe to the braſs, and thus performs the part of a valve, and keeps it cloſe ſo that no air can enter. But the piſton having reached the top of the barrel, a hole F in the ſide of it is juſt below the piſton, and the air ruſhes through this hole and fills the barrel. Now puſh the piſton down again, it immediately paſſes the hole F, and no air eſcapes through it; it therefore forces open the valve at *f*, and eſcapes while the piſton moves to the bottom.

Now let E be any veſſel, ſuch as a glaſs bottle, having its mouth furniſhed with a braſs cap firmly cemented to it, having a hollow ſcrew which fits a ſolid ſcrew *po*, turned on the cylindric nozzle of the ſyringe. Screw the ſyringe into this cap, and it is evident that the air forced out of the ſyringe will be accumulated in this veſſel: for upon drawing up the piſton the valve *f* always ſhuts by the elaſticity or expanding force of the air in E; and on puſhing it down again, the valve will open as ſoon as the piſton has got ſo far down that the air in the lower part of the barrel is more powerful than the air already in the veſſel. Thus at every ſtroke an additional barrelful of air will be forced into the veſſel E; and it will be found, that after every ſtroke the piſton muſt be farther puſhed down before the valve will open. It cannot open till the preſſure ariſing from the elaſticity of the air condenſed in the barrel is ſuperior to the elaſticity of the air condenſed in the veſſel; that is, till the condenſation of the firſt, or its denſity, is *ſomewhat* greater than that of the laſt, in order to overcome the ſtraining of the valve on the hole and the ſticking occaſioned by the clammy matter employed to make it air-tight. 59 its veſſel or receiver.

60 A different conſtruction of this ſyringe.

Sometimes the ſyringe is conſtructed with a valve in the piſton. This piſton, inſtead of being of one piece and ſolid, conſiſts of two pieces perforated. The upper part *ikum* is connected with the rod or handle, and has its lower part turned down to a ſmall cylinder, which is ſcrewed into the lower part *klon*; and has a perforation *gh* going up in the axis, and terminating in a hole *h* in one ſide of the rod, a piece of oiled leather is ſtrained acroſs the hole *g*. When the piſton is drawn up and a void left below it, the weight of the external air forces it through the hole *hg*, opens the valve *g*, and fills the barrel. Then, on puſhing down the piſton, the air being ſqueezed into leſs room, preſſes on the valve *g*, ſhuts it; and none eſcaping through the piſton, it is gradually condenſed as the piſton deſcends till it opens the valve *f*, and is added to that already accumulated in the veſſel E.

61 Elaſticity of the air increaſed by condenſation.

Having in this manner forced a quantity of air into the veſſel E, we can make many experiments in it in this ſtate of condenſation. We are chiefly concerned at preſent with the effect which this produces on its elaſticity. We ſee this to be greatly increaſed; for we find more and more force required for introducing every ſucceſſive barrelful. When the ſyringe is unſcrewed, we ſee the air ruſh out with great violence, and every indication of great expanding force. If the ſyringe be connected with the veſſel E in the ſame manner as the ſyringe in N° 17. viz. by interpoſing a ſtopcock B between them (ſee fig. 3.), and if this ſtopcock have a pipe at its extremity, reaching near to the bottom of the veſſel, which is previouſly half filled with water, we can obſerve diſtinctly when the elaſticity of the air in the ſyringe exceeds that of the air in the receiver: for the piſton muſt be puſhed down a certain length before the air from the ſyringe bubbles up through the water, and the

the piſton muſt be farther down at each ſucceſſive ſtroke before this appearance is obſerved. When the air has thus been accumulated in the receiver, it preſſes the ſides of it outward, and will burſt it if not ſtrong enough. It alſo preſſes on the ſurface of the water; and if we now ſhut the cock, unſcrew the ſyringe, and open the cock again, the air will force the water through the pipe with great velocity, cauſing it to riſe in a beautiful jet. When a metal-receiver is uſed, the condenſation may be puſhed to a great length, and the jet will then riſe to a great height, which gradually diminiſhes as the water is expended and room given to the air to expand itſelf. See the figure.

62 A method of judging of the condenſation, &c. We judge of the condenſation of air in the veſſel E by the number of ſtrokes and the proportion of the capacity of the ſyringe to that of the veſſel. Suppoſe the firſt to be one-tenth of the laſt; then we know, that after 10 ſtrokes the quantity of air in the veſſel is doubled, and therefore its denſity double, and ſo on after any number of ſtrokes. Let the capacity of the ſyringe (when the piſton is drawn to the top) be a, and that of the veſſel be b, and the number of ſtrokes be n, the denſity of air in the veſſel will be $\frac{b+n\,a}{b}$, or $1+\frac{n\,a}{b}$.

63 not perfectly accurate. But this is on the ſuppoſition that the piſton accurately fills the barrel, the bottom of the one applying cloſe to that of the other, and that no force is neceſſary for opening either of the valves: but the firſt cannot be inſured, and the laſt is very far from being true. In the conſtruction now deſcribed, it will require at leaſt one-twentieth part of the ordinary preſſure of the air to open the piſton valve: therefore the air which gets in will want at leaſt this proportion of its complete elaſticity; and there is always a ſimilar part of the elaſticity employed in opening the nozzle valve. The condenſation therefore is never nearly equal to what is here determined.

64 A better method. It is accurately enough meaſured by a gage fitted to the inſtrument. A glaſs tube GH of a cylindric bore, and cloſe at the end, is ſcrewed into the ſide of the cap on the mouth of the veſſel E. A ſmall drop of water or mercury is taken into this tube by warming it a little in the hand, which expands the contained air, ſo that when the open end is dipped into water, and the whole allowed to cool, the water advances a little into the tube. The tube is furniſhed with a ſcale divided into ſmall equal parts, numbered from the cloſe end of the tube. Since this tube communicates with the veſſel, it is evident that the condenſation will force the water along the tube, acting like a piſton on the air beyond it, and the air in the tube and veſſel will always be of one denſity. Suppoſe the number at which the drop ſtands before the condenſation is made to be c, and that it ſtands at d when the condenſation has attained the degree required, the denſity of the air in the remote end of the gage, and conſequently in the veſſel, will be $\frac{c}{d}$.

65 A variation of it. Sometimes there is uſed any bit of tube cloſe at one end, having a drop of water in it, ſimply laid into the veſſel E, and furniſhed or not with a ſcale: but this can only be uſed with glaſs veſſels, and theſe are too weak to reſiſt the preſſure ariſing from great condenſation. In ſuch experiments metalline veſſels are uſed, fitted with a variety of apparatus for different experiments. Some of theſe will be occaſionally mentioned afterwards.

It muſt be obſerved in this place, that very great condenſations require great force, and therefore ſmall ſyringes. It is therefore convenient to have them of various ſizes, and to begin with thoſe of a larger diameter, which operate more quickly; and when the condenſation becomes fatiguing, to change the ſyringe for a ſmaller. 66 Syringes for great condenſations.

For this reaſon, and in general to make the condenſing apparatus more convenient, it is proper to have a ſtop-cock interpoſed between the ſyringe and the veſſel, or as it is uſually called the receiver. This conſiſts of a braſs pipe, which has a well ground cock in its middle, and has a hollow ſcrew at one end, which receives the nozzle ſcrew of the ſyringe, and a ſolid ſcrew at the other end, which fits the ſcrew of the receiver. See fig. 3. 67 A ſtop-cock between the ſyringe and receiver.

By theſe gages, or contrivances ſimilar to them, we have been able to aſcertain very great degrees of condenſation in the courſe of ſome experiments. Dr Hales found, that when dry wood was put into a ſtrong veſſel, which it almoſt filled, and the remainder was filled with water, the ſwelling of the wood, occaſioned by its imbibition of water, condenſed the air of his gage into the thouſandth of its original bulk. He found that peaſe treated in the ſame way generated elaſtic air, which preſſing on the air in the gage condenſed it into the fifteen hundredth part of its bulk. This is the greateſt condenſation that has been aſcertained with preciſion, although in other experiments it has certainly been carried much farther; but the preciſe degree could not be aſcertained. 68 Inſtances of great condenſation prove

The only uſe to be made of this obſervation at preſent is, that ſince we have been able to exhibit air in a denſity a thouſand times greater than the ordinary denſity of the air we breathe, it cannot, as ſome imagine, be only a different form of water; for in this ſtate it is as denſe or denſer than water, and yet retains its great expanſibility. 69 air and water to be eſſentially different;

Another important obſervation is, that in every ſtate of denſity in which we find it, it retains its perfect fluidity, tranſmitting all preſſures which are applied to it with undiminiſhed force, as appears by the equality conſtantly obſerved between the oppoſing columns of water or other fluid by which it is compreſſed, and by the facility with which all motions are performed in it in the moſt compreſſed ſtates in which we can make obſervations of this kind. This fact is totally incompatible with the opinion of thoſe who aſcribe the elaſticity of air to the ſpringy ramified ſtructure of its particles, touching each other like ſo many pieces of ſponge or foot-balls. A collection of ſuch particles might indeed be pervaded by ſolid bodies with conſiderable eaſe, if they were merely touching each other, and not ſubjected to any external preſſure. But the moment ſuch preſſure is exerted, and the aſſemblage ſqueezed into a ſmaller ſpace, each preſſes on its adjoining particles: they are individually compreſſed, flattened in their touching ſurfaces, and *before the denſity is doubled* they are ſqueezed into the form of perfect cubes, and compoſe a maſs, 70 and ſhow the error of ſome opinions reſpecting elaſticity, &c.

maſs, which may indeed propagate preſſure from one place to another in an imperfect manner, and with great diminution of its intenſity, but will no more be fluid than a maſs of ſoft clay. It will be of uſe to keep this obſervation in mind.

71 Conſequences of the air's elaſticity.

We have ſeen the air is heavy and compreſſible, and might now proceed to deduce in order the explanation of the appearances conſequent on each of theſe properties. But, as has been already obſerved, the elaſticity of air modifies the effects of its gravity ſo remarkably, that they would be imperfectly underſtood if both qualities were not combined in our conſideration of either. At any rate, ſome farther conſequences of its elaſticity muſt be conſidered, before we underſtand the means of varying at pleaſure the effects of its gravity.

72 Its great expanſibility

Since air is heavy, the lower ſtrata of a maſs of air muſt ſupport the upper; and, being compreſſible, they muſt be condenſed by their weight. In this ſtate of compreſſion the elaſticity of the lower ſtrata of air acts in oppoſition to the weight of the incumbent air, and balances it. There is no reaſon which would make us ſuppoſe that its expanding force belongs to it only when in ſuch a ſtate of compreſſion. It is more probable, that, if we could free it from this preſſure, the air would expand itſelf into ſtill greater bulk. This is moſt diſtinctly ſeen in the following experiment.

73 proved by experiment. Fig. 11.

Into the cylindric jar ABCD (fig. 11.) which has a ſmall hole in its bottom, and is furniſhed with an air-tight piſton E, put a ſmall flaccid bladder, having its mouth tied tight with a ſtring. Having puſhed the piſton near to the bottom, and noticed the ſtate of the bladder, ſtop up the hole in the bottom of the jar with the finger, and draw up the piſton, which will require a conſiderable force. You will obſerve the bladder ſwell out, as if air had been blown into it; and it will again collapſe on allowing the piſton to deſcend. Nothing can be more unexceptionable than the concluſion from this experiment, that ordinary air is in a ſtate of compreſſion, and that its elaſticity is not limited to this ſtate. The bladder being flaccid, ſhows that the included air is in the ſame ſtate with the air which ſurrounds it; and the ſame muſt be affirmed of it while it ſwells but ſtill remains flaccid. We muſt conclude, that the whole air within the veſſel expands, and continues to fill it, when its capacity has been enlarged. And ſince this is obſerved to go on as long as we give it more room, we conclude, that by ſuch experiments we have not yet given it ſo much room as it can occupy.

74 Attempts to diſcover the limits of this expanſion by

It was a natural object of curioſity to diſcover the limits of this expanſion; to know what was the natural unconſtrained bulk of a quantity of air, beyond which it would not expand though all external compreſſing force were removed. Accordingly philoſophers conſtructed inſtruments for *rarefying* the air. The common water pump had been long familiar, and appeared very proper for this purpoſe. The moſt obvious is the following.

75 a ſyringe; Fig. 12.

Let the barrel of the ſyringe AB (fig. 12.) communicate with the veſſel V, with a ſtopcock C between them. Let it communicate with the external air by another orifice D, in any convenient ſituation, alſo furniſhed with a ſtopcock. Let this ſyringe have a piſton very accurately fitted to it ſo as to touch the bottom all over when puſhed down, and have no vacancy about the ſides.

76 from the operation of which

Now, ſuppoſe the piſton at the bottom, the cock C open, and the cock D ſhut, draw the piſton to the top. The air which filled the veſſel V will expand ſo as to fill both that veſſel and the barrel AB; and as no reaſon can be given to the contrary, we muſt ſuppoſe that the air will be uniformly diffuſed through both. Calling V and B the capacity of the veſſel and barrel, it is plain that the bulk of the air will now be $V+B$; and ſince the quantity of matter remains the ſame, and the denſity of a fluid is as its quantity of matter directly and its bulk inverſely, the denſity of the expanded air will be $\frac{V}{V+B}$, the denſity of common air being 1: for $V+B : V = 1 : \frac{V}{V+B}$.

77 we infer the diminution of the elaſticity of expanded air.

The piſton requires force to raiſe it, and it is raiſed in oppoſition to the preſſure of the incumbent atmoſphere; for this had formerly been balanced by the elaſticity of the common air: and we conclude from the fact, *that force is required to raiſe the piſton*, that the elaſticity of the expanded air is leſs than that of air in its ordinary ſtate; and an accurate obſervation of the force neceſſary to raiſe it would ſhow how much the elaſticity is diminiſhed. When therefore the piſton is let go, it will deſcend as long as the preſſure of the atmoſphere exceeds the elaſticity of the air in the barrel; that is, till the air in the barrel is in a ſtate of ordinary denſity. To put it further down will require force, becauſe the air muſt be compreſſed in the barrel; but if we open the cock D, the air will be expelled through it, and the piſton will reach the bottom.

78 and calculate its denſity.

Now ſhut the *diſcharging cock* D, and open the cock C, and draw up the piſton. The air which occupied the ſpace V, with the denſity $\frac{V}{V+B}$, will now occupy the ſpace $V+B$, if it expands ſo far. To have its denſity D, ſay, As its preſent bulk $V+B$ is to its former bulk V, ſo is its former denſity $\frac{V}{V+B}$ to its new denſity, which will therefore be $\frac{V+V}{\overline{V+B}\times\overline{V+B}}$, or $\left|\frac{V}{V+B}\right|^2$.

79

It is evident, that if the air continues to expand, the denſity of the air in the veſſel after the third drawing up of the piſton will be $\left|\frac{V}{V+B}\right|^3$, after the fourth it will be $\left|\frac{V}{V+B}\right|^4$, and after any number of ſtrokes n will be $\left|\frac{V}{V+B}\right|^n$. Thus, if the veſſel is four times as large as the barrel, the denſity after the fifth ſtroke will be $\frac{1024}{3125}$, nearly $\frac{1}{3}$ of its ordinary denſity.

80

On the other hand, the number n of ſtrokes neceſſary for reducing air to the denſity D is $\frac{\text{Log D}}{\text{Log V} - \text{Log}(V+B)}$.

81 Some inconveniences of this inſtrument.

Thus we ſee that this inſtrument can never abſtract the whole air in conſequence of its expanſion, but only rarefy it continually as long as it continues to expand; nay, there is a limit beyond which the rarefaction cannot

not go. When the piſton has reached the bottom, there remains a ſmall ſpace between it and the cock C filled with common air. When the piſton is drawn up, this ſmall quantity of air expands, and alſo a ſimilar quantity in the neck of the other cock; and no air will come out of the receiver V till the expanded air in the barrel is of a ſmaller denſity than the air in the receiver. This circumſtance evidently directs us to make theſe two ſpaces as ſmall as poſſible, or by ſome contrivance to fill them up altogether. Perhaps this may be done

82 Remedied by another, Fig. 13. effectually in the following manner.

Let BE (fig. 13.) repreſent the bottom of the barrel, and let the circle HKI be the ſection of the key of the cock, of a large diameter, and place it as near to the barrel as can be. Let this communicate with the barrel by means of a hole FG widening upwards, as the fruſtum of a hollow obtuſe cone. Let the bottom of the piſton *bfhge* be ſhaped ſo as to fit the bottom of the barrel and this hole exactly. Let the cock be pierced with two holes. One of them, HI, paſſes perpendicularly through its axis, and forms the communication between the receiver and barrel. The other hole, KL, has one extremity K on the ſame circumference with H, ſo that when the key is turned a fourth part round, K will come into the place of H: but this hole is pierced obliquely into the key, and thus keeps clear of the hole HI. It goes no further than the axis, where it communicates with a hole bored along the axis, and terminating at its extremity. This hole forms the communication with the external air, and ſerves for diſcharging the air in the barrel. (A ſide

Fig. 14. view of the key is ſeen in fig. 14.). Fig. 12. ſhows the poſition of the cock while the piſton is moving upwards, and fig. 14. ſhows its poſition while the piſton is moving downwards. When the piſton has reached the bottom, the conical piece *fhg* of the piſton, which may be of firm leather, fills the hole FHG; and therefore completely expels the air from the barrel. The canal KL*l* of the cock contains air of the common denſity; but this is turned aſide into the poſition KL (fig. 13.), while the piſton is ſtill touching the cock. It cannot extend into the barrel during the aſcent of the piſton. In place of it the perforation HLI comes under the piſton, filled with air that had been turned aſide with it when the piſton was at the top of the barrel, and therefore of the ſame denſity with the air of the receiver. It appears therefore that there is no limit to the rarefaction as long as the air will expand.

83 called an *exhauſting ſyringe*. This inſtrument is called an Exhausting Syringe. It is more gennerally made in another form, which is much leſs expenſive, and more convenient in its uſe. Inſtead of being furniſhed with *cocks* for eſtabliſhing the communications and ſhutting them, as is neceſſary, it has *valves* like thoſe of the condenſing ſyringe, but opening in the oppoſite direction. It is thus made:

84 Its conſtruction and Fig. 15. The pipe of communication or conduit MN (fig. 15.) has a male ſcrew in its extremity, and over this is tied a ſlip of bladder or leather M. The lower half of the piſton has alſo a male ſcrew on it, covered at the end with a ſlip of bladder O. This is ſcrewed into the upper half of the piſton, which is pierced with a hole H coming out of the ſide of the rod.

85 operation. Now ſuppoſe the ſyringe ſcrewed to the conducting pipe, and that ſcrewed into the receiver V, and the piſton at the bottom of the barrel. When the piſton is drawn up, the preſſure of the external air ſhuts the valve O, and a void is left below the piſton: there is therefore no preſſure on the upper ſide of the valve M to balance the elaſticity of the air in the receiver which formerly balanced the weight of the atmoſphere. The air therefore in the receiver lifts this valve, and diſtributes itſelf between the veſſel and the barrel; ſo that when the piſton has reached the top the denſity of the air in both receiver and barrel is as before $\frac{V}{V+B}$.

When the piſton is let go it deſcends, becauſe the 86
elaſticity of the expanded air is not a balance for the preſſure of the atmoſphere, which therefore preſſes down the piſton with the difference, keeping the piſton-valve ſhut all the while. At the ſame time the valve M alſo ſhuts: for it was opened by the prevailing elaſticity of the air in the receiver, and while it is open the two airs have equal denſity and elaſticity; but the moment the piſton deſcends, the capacity of the barrel is diminiſhed, the elaſticity of its air increaſes by collapſing, and now prevailing over that of the air in the receiver ſhuts the valve M.

When it has arrived at ſuch a part of the barrel that 87
the air in it is of the denſity of the external air, there is no force to puſh it farther down; the hand muſt therefore preſs it. This attempts to condenſe the air in the barrel, and therefore increaſes its elaſticity; ſo that it lifts the valve O and eſcapes, and the piſton gets to the bottom. When drawn up again, greater force is required than the laſt time, becauſe the elaſticity of the included air is leſs than in the former ſtroke. The piſton riſes further before the valve M is lifted up, and when it has reached the top of the barrel the denſity of the included air is $\left|\frac{V}{V+B}\right|^{2}$. The piſton, when let go, will deſcend further than it did before ere the piſton-valve open, and the preſſure of the hand will again puſh it to the bottom, all the air eſcaping through O. The rarefaction will go on at every ſucceſſive ſtroke in the ſame manner as with the other ſyringe. 88

This ſyringe is evidently more eaſy in its uſe, requir- Advantages
ing no attendance to the cocks to open and ſhut them of this ſyringe over
at the proper times. On this account this conſtruc- the former,
tion of an exhauſting ſyringe is much more generally and
uſed. 89

But it is greatly inferior to the ſyringe with cocks its inferi-
with reſpect to its power of rarefaction. Its operation ority.
is greatly limited. It is evident that no air will come out of the receiver unleſs its elaſticity *exceed* that of the air in the barrel by a difference able to lift up the valve M. A piece of oiled leather tied acroſs this hole can hardly be made tight and certain of clapping to the hole without ſome ſmall ſtraining, which muſt therefore be overcome. It muſt be very gentle indeed not to require a force equal to the weight of two inches of water, and this is equal to about the 200th part of the whole elaſticity of the ordinary air; and therefore this ſyringe, for this reaſon alone, cannot rarefy air above 200 times, even though air were capable of an indefinite expanſion. In like manner the valve O cannot be raiſed without a ſimilar prevalence of the elaſticity of the air in the barrel above the weight of the atmoſphere. Theſe cauſes united, make it difficult to rarefy the air more than 100 times, and very few ſuch ſyringes will

rarefy

rarefy it more than 50 times; whereas the syringe with cocks, when new and in good order, will rarefy it 1000 times.

90 The former syringe, however, more liable to go out of order.

But, on the other hand, syringes with cocks are much more expensive, especially when furnished with apparatus for opening and shutting the cocks. They are more difficult to make equally tight, and (which is the greatest objection) do not remain long in good order. The cocks, by so frequently opening and shutting, grow loose, and allow the air to escape. No method has been found of preventing this. They must be ground tight by means of emery or other cutting powders. Some of these unavoidably stick in the metal, and continue to wear it down. For this reason philosophers, and the makers of philosophical instruments, have turned their chief attention to the improvement of the syringe with valves. We have been thus minute in the account of the operation of rarefaction, that the reader may better understand the value of these improvements, and in general the operation of the principal pneumatic engines.

Of the Air-Pump.

91 Invention of the air-pump by Guericke.

An Air-Pump is nothing but an exhausting syringe accommodated to a variety of experiments. It was first invented by Otto Guericke, a gentleman of Magdeburgh in Germany, about the year 1654. We trust that it will not be unacceptable to our readers to see this instrument, which now makes a principal article in a philosophical apparatus, in its first form, and to trace it through its successive steps to its present state of improvement.

Guericke, indifferent about the solitary possession of an invention which gave entertainment to numbers who came to see his wonderful experiments, gave a minute description of all his pneumatic apparatus to Gaspar Schottus professor of mathematics at Wirtemberg, who immediately published it with the author's consent, with an account of some of its performances, first in 1657, in his *Mechanica Hydraulico-pneumatica;* and then in his *Technica Curiosa*, in 1664, a curious collection of all the wonderful performances of art which he collected by a correspondence over all Europe.

92 Construction of his pump. Fig. 16.

Otto Guericke's air-pump consists of a glass receiver A (fig. 16.) of a form nearly spherical, fitted up with a brass cap and cock B. The nozzle of the cap was fixed to a syringe CDE, also of brass, bent at D into half a right angle. This had a valve at D, opening from the receiver into the syringe, and shutting when pressed in the opposite direction. In the upper side of the syringe there is another valve F, opening from the syringe into the external air, and shutting when pressed inwards. The piston had no valve. The syringe, the cock B, and the joint of the tube, were immersed in a cistern filled with water. From this description it is easy to understand the operation of the instrument. When the piston was drawn up from the bottom of the syringe, the valve F was kept shut by the pressure of the external air, and the valve D opened by the elasticity of the air in the receiver. When it was pushed down again, the valve D immediately shut by the superior elasticity of the air in the syringe; and when this was sufficiently compressed, it opened the valve F, and was discharged. It was immersed in water, that no air might find its way through the joints or cocks. Air-pump.

93 Its imperfections.

It would seem that this machine was not very perfect, for Guericke says that it took several hours to produce an evacuation of a moderate-sized vessel; but he says, that when it was in good order, the rarefaction (for he acknowledges that it was not, nor could be, a complete evacuation) was so great, that when the cock was opened, and water admitted, it filled the receiver so as sometimes to leave no more than the bulk of a pea filled with air. This is a little surprising; for if the valve F be placed as far from the bottom of the syringe as in Schottus's figure, it would appear that the rarefaction could not be greater than what must arise from the air in DF expanding till it filled the whole syringe: because as soon as the piston in its descent passes F it can discharge no more air, but must compress it between F and the bottom, to be expanded again when the piston is drawn up. It is probable that the piston was not very tight, but that on pressing it down it allowed the air to pass it; and the water in which the whole was immersed prevented the return of the air when it was drawn up again: and this accounts for the great time necessary for producing the desired rarefaction.

94 His improvement of it. Fig. 17.

Guericke, being a gentleman of fortune, spared no expence, and added a part to the machine, which saved his numerous visitants the trouble of hours attendance before they could see the curious experiments with the rarefied air. He made a large copper vessel G (fig. 17.), having a pipe and cock below, which passed through the floor of the chamber into an under apartment, where it was joined to the syringe immersed in the cistern of water, and worked by a lever. The upper part of the vessel terminated in a pipe, furnished with a stopcock H, surrounded with a small brim to hold water for preventing the ingress of air. On the top was another cap I, also filled with water, to protect the junction of the pipes with the receiver K. This great vessel was always kept exhausted, and workmen attended below. When experiments were to be performed in the receiver K, it was set on the top of the great vessel, and the cock H was opened. The air in K immediately diffused itself equally between the two vessels, and was so much more rarefied as the receiver K was smaller than the vessel G. When this rarefaction was not sufficient, the attendants below immediately worked the pump.

These particulars deserve to be recorded, as they show the inventive genius of this celebrated philosopher, and because they are useful even in the present advanced state of the study. Guericke's method of excluding air from all the joints of his apparatus, by immersing these joints in water, is the only method that has to this day been found effectual; and there frequently occur experiments where this exclusion for a long time is absolutely necessary. In such cases it is necessary to construct little cups or cisterns at every joint, and to fill them with water or oil. In a letter to Schottus, 1662-3, he describes very ingenious contrivances for producing complete rarefaction after the elasticity of the remaining air has been so far diminished that it is not able to open the valves. He opens the exhausting valves by a plug, which is pushed in by the hand; and the discharging valve is opened by a small pump placed on its outside, so that it opens into a void instead of opening against the pressure

Air-pump.

pressure of the atmosphere. (See *Schotti Technica Curiosa*, p. 68. 70.). These contrivances have been lately added to air-pumps by Haas and Hurter as new inventions.

It must be acknowledged, that the application of the pump or syringe to the exhaustion of air was a very obvious thought on the principle exhibited in N° 17. and in this way it was also employed by Guericke, who first filled the receiver with water, and then applied the syringe. But this was by no means either his object or his principle. His object was not solely to procure a vessel void of air, but to exhaust the air which was already in it; and his principle was the power which he suspected to be in air of expanding itself into a greater space when the force was removed which he supposed to compress it. He expressly says (*Tract. de Experimentis Magdeburgicis, et in Epist. ad Schottum*), that the contrivance occurred to him accidentally when occupied with experiments in the Toricellian tube, in which he found that the air would really expand, and completely fill a much larger space than what it usually occupied, and that he had found no limits to the expansion, evincing this by facts which we shall perfectly understand by and by. This was a doctrine quite new, and required a philosophical mind to view it in a general and systematic manner; and it must be owned that his manner of treating the subject is equally remarkable for ingenuity and for modesty. (*Epist. ad Schottum*).

95 Merits of Guericke.

96 Progress of experimental philosophy.

His doctrine and his machine were soon spread over Europe. It was the age of literary ardour and philosophical curiosity; and it is most pleasant to us, who, standing on the shoulders of our predecessors, can see far around us, to observe the eagerness with which every new, and to us frivolous, experiment was repeated and canvassed. The worshippers of Aristotle were daily receiving severe mortifications from the experimenters, or empirics as they affected to call them, and they exerted themselves strenuously in support of his now tottering cause. This contributed to the rapid propagation of every discovery; and it was a most profitable and respectable business to go through the chief cities of Germany and France exhibiting philosophical experiments.

97 Ardour of Mr Boyle.

About this time the foundations of the Royal Society of London were laid. Mr Boyle, Mr Wren, Lord Brounker, Dr Wallis, and other curious gentlemen, held meetings at Oxford, in which were received accounts of whatever was doing in the study of nature; and many experiments were exhibited. The researches of Galileo, Toricelli, and Paschal, concerning the pressure of the air, greatly engaged their attention, and many additions were made to their discoveries. Mr Boyle, the most ardent and successful studier of nature, had the principal share in these improvements, his inquisitive mind being aided by an opulent fortune. In a letter to his nephew Lord Dungarvon, he says that he had made many attempts to see the appearances exhibited by bodies freed from the pressure of the air. He had made Toricellian tubes, having a small vessel a-top, into which he put some bodies before filling the tubes with mercury; so that when the tube was set upright, and the mercury run out, the bodies were *in vacuo*. He had also abstracted the water from a vessel, by a small pump, by means of its weight, in the manner described in N° 17, having previously put bodies into the vessel along with the water. But all these ways were very troublesome and imperfect. He was delighted when he learned from Schottus's first publication, that Counsellor Guericke had effected this by the expansive power of the air; and immediately set about constructing a machine from his own ideas, no description of Guericke's being then published.

It consisted of a receiver A (fig. 18.), furnished with a stopcock B, and syringe CD placed in a vertical position below the receiver. Its valve C was in its bottom, close adjoining to the entry of the pipe of communication; and the hole by which the air issued was farther secured by a plug which could be removed. The piston was moved by a wheel and rackwork. The receiver of Guericke's pump was but ill adapted for any considerable variety of experiments; and accordingly very few were made in it. Mr Boyle's receiver had a large opening EF, with a strong glass margin. To this was fitted a strong brass cap, pierced with a hole G in its middle, to which was fitted a plug ground into it, and shaped like the key of a cock. The extremity of this key was furnished with a screw, to which could be affixed a hook, or a variety of pieces for supporting what was to be examined in the receiver, or for producing various motions within it, without admitting the air. This was farther guarded against by means of oil poured round the key, where it was retained by the hollow cup-like form of the cover. With all these precautions, however, Mr Boyle ingenuously confesses, that it was but seldom, and with great difficulty, that he could produce an extreme degree of rarefaction; and it appears by Guericke's letter to Schottus, that in this respect the Magdeburgh machine had the advantage. But most of Boyle's very interesting experiments did not require this extreme rarefaction; and the variety of them, and their philosophic importance, compensated for this defect, and soon eclipsed the fame of the inventor to such a degree, that the state of air in the receiver was generally denominated the *vacuum Boyleanum*, and the air-pump was called *machina Boyleana*. It does not appear that Guericke was at all solicitous to maintain his claim to priority of invention. He appears to have been of a truly noble and philosophical mind, aiming at nothing but the advancement of science.

Plate cccxxv. fig. 18.

98 His air-pump.

Mr Boyle found, that to make a vessel air-tight, it was sufficient to place a piece of wet or oiled leather on its brim, and to lay a flat plate of metal upon this. The pressure of the external air squeezed the two solid bodies so hard together, that the soft leather effectually excluded it. This enabled him to render the whole machine incomparably more convenient for a variety of experiments. He caused the conduit-pipe to terminate in a flat plate which he covered with leather, and on this he set the glass ball or receiver, which had both its upper and lower brim ground flat. He covered the upper orifice in like manner with a piece of oiled leather and a flat plate, having cocks and a variety of other perforations and contrivances suited to his purposes. This he found infinitely more expeditious, and also tighter, than the clammy cements which he had formerly used for securing the joints.

99 His contrivances to make vessels air-tight.

He was now assisted by Dr Hooke, the most ingenious and inventive mechanic that the world has ever seen. This person made a great improvement on the air-pump, by applying two syringes whose piston-rods were worked by

100 Dr Hooke's improvement of Boyle's air-pump.

Air-pump. Fig. 20. by the same wheel, as in fig. 20. and putting valves in the pistons in the same manner as in the piston of a common pump. This evidently doubled the expedition of the pump's operation; but it also greatly diminished the labour of pumping: for it must be observed, that the piston H must be drawn up against the pressure of the external air, and when the rarefaction is nearly perfect this requires a force of nearly 15 pounds for every inch of the area of the piston. Now when one piston H is at the bottom of the barrel, the other K is at the top of the barrel, and the air below K is equally rare with that in the receiver. Therefore the pressure of the external air on the piston K is *nearly* equal to that on the piston H. Both, therefore, are acting in opposite directions on the wheel which gave them motion; and the force necessary for raising H is only the difference between the elasticity of the air in the barrel H and that of the air in the barrel K. This is very small in the beginning of the stroke, but gradually increases as the piston K descends, and becomes equal to the whole excess of the air's pressure above the elasticity of the remaining air of the receiver when the air at K of the natural density begins to open the piston valves. An accurate attention to the circumstances will show us that the force requisite for working the pump is greatest at first, and gradually diminishes as the rarefaction advances; and when this is nearly complete, hardly any more force is required than what is necessary for overcoming the friction of the pistons, except during the discharge of the air at the end of each stroke.

101 Generally adopted. This is therefore the form of the air-pump which is most generally used all over Europe. Some traces of national prepossession remain. In Germany, air-pumps are frequently made after the original model of Guericke's (Wolff Cyclomathesis); and the French generally use the pump made by Papin, though extremely awkward. We shall give a description of Boyle's air-pump as finally improved by Hawkesbee, which, with some small accommodations to particular views, still remains the most approved form.

102 Hawkesbee's improvements. Here follows the description from Desaguliers.

Fig. 19. It consists of two brass barrels *a a*, *a a* (fig. 19.), 12 inches high and 2 wide. The pistons are raised and depressed by turning the winch *b b*. This is fastened to an axis passing through a strong toothed wheel, which lays hold of the teeth of the racks *c c c c*. Then the one is raised while the other is depressed; by which means the valves, which are made of limber bladder, fixed in the upper part of each piston, as well as in the openings into the bottom of the barrels, perform their office of discharging the air from the barrels, and admitting into them the air from the receiver to be afterwards discharged; and when the receiver comes to be pretty well exhausted of its air, the pressure of the atmosphere in the descending piston is nearly so great, that the power required to raise the other is little more than is necessary for overcoming the friction of the piston, which renders this pump preferable to all others, which require more force to work them as the rarefaction of the air in the receiver advances.

103 Barrels. The barrels are set in a brass dish about two inches deep, filled with water or oil to prevent the insinuation of air. The barrels are screwed tight down by the nuts *e e*, *e e*, which force the frontispiece *f f* down on them, through which the two pillars *g g*, *g g* pass.

From between the barrels rises a slender brass pipe *h h*, communicating with each by a perforation in the transverse piece of brass on which they stand. The upper end of this pipe communicates with another perforated piece of brass, which screws on underneath the plate *i i i i*, of ten inches diameter, and surrounded with a brass rim to prevent the shedding of water used in some experiments. This piece of brass has three branches: 1st, An horizontal one communicating with the conduit pipe *h h*. 2d, An upright one screwed into the middle of the pump-plate, and terminating in a small pipe *k*, rising about an inch above it. 3d, A perpendicular one, looking downwards in the continuation of the pipe *k*, and having a hollow screw in its end receiving the brass cap of the gage-pipe *l l l l*, which is of glass, 34 inches long, and immersed in a glass cistern *m m* filled with mercury. This is covered a-top with a cork float, carrying the weight of a light wooden scale divided into inches, which are numbered from the surface of the mercury in the cistern. This scale will therefore rise and fall with the mercury in the cistern, and indicate the true elevation of that in the tube. 104 Brass pipe, &c.

105 Stopcock. There is a stopcock immediately above the insertion of the gage-pipe, by which its communication may be cut off. There is another at *n*, by which a communication is opened with the external air, for allowing its readmission; and there is sometimes another immediately within the insertion of the conduct-pipe for cutting off the communication between the receiver and the pump. This is particularly useful when the rarefaction is to be continued long, as there are by these means fewer chances of the insinuation of air by the many joints.

106 Receivers. The receivers are made tight by simply setting them on the pump-plate with a piece of wet or oiled leather between; and the receivers which are open a-top, have a brass cover set on them in the same manner. In these covers there are various perforations and contrivances for various purposes. The one in the figure has a slip wire passing through a collar of oiled leather, having a hook or a screw in its lower end for hanging any thing on or producing a variety of motions.

107 Contrivance for removing them. Sometimes the receivers are set on another plate, which has a pipe screwed into its middle, furnished with a stopcock and a screw, which fits the middle pipe *k*. When the rarefaction has been made in it, the cock is shut, and then the whole may be unscrewed from the pump, and removed to any convenient place. This is called a *transporter plate*.

108 Principle upon which the gage is constructed. It only remains to explain the gage *l l l l*. In the ordinary state of the air its elasticity balances the pressure of the incumbent atmosphere. We find this from the force that is necessary to squeeze it into less bulk in opposition to this elasticity. Therefore the elasticity of the air increases with the vicinity of its particles. It is therefore reasonable to expect, that when we allow it to occupy more room, and its particles are farther asunder, its elasticity will be diminished though not annihilated; that is, it will no longer balance the WHOLE pressure of the atmosphere, though it may still balance part of it. If therefore an upright pipe have its lower end immersed in a vessel of mercury, and communicate by its upper end with a vessel containing rarefied, therefore less elastic, air, we should expect that the pressure of the air will prevail, and force the mercury into the tube, and cause it to rise to such a height that the

the weight of the mercury, joined to the elaſticity of the rarefied air acting on its upper ſurface, ſhall be exactly equal to the whole preſſure of the atmoſphere. The height of the mercury is the exact meaſure of that part of the whole preſſure which is not balanced by the elaſticity of the rarefied air, and its deficiency from the height of the mercury in the Toricellian tube is the exact meaſure of this remaining elaſticity.

109 ſo as to indicate the degree of rarefaction.

It is evident therefore, that the pipe will be a ſcale of the elaſticity of the remaining air, and will indicate in ſome ſort the degree of rarefaction: for there muſt be ſome analogy between the denſity of the air and its elaſticity; and we have no reaſon to imagine that they do not increaſe and diminiſh together, although we may be ignorant of the law, that is, of the change of elaſticity correſponding to a known change of denſity. This is to be diſcovered by experiment; and the air-pump itſelf furniſhes us with the beſt experiments for this purpoſe. After rarefying till the mercury in the gage has attained half the height of that in the Toricellian tube, ſhut the communication with the barrels and gage, and admit the water into the receiver. It will go in till all is again in equilibrio with the preſſure of the atmoſphere; that is, till the air in the receiver has collapſed into its natural bulk. This we can accurately meaſure, and compare with the whole capacity of the receiver; and thus obtain the preciſe degree of rarefaction correſponding to half the natural elaſticity. We can do the ſame thing with the elaſticity reduced to one-third, one-fourth. &c. and thus diſcover the whole law.

110 Inconveniences of this gage,

This gage muſt be conſidered as one of the moſt ingenious and convenient parts of Hawkeſbee's pump; and it is well diſpoſed, being in a ſituation protected againſt accidents: but it neceſſarily increaſes greatly the ſize of the machine, and cannot be applied to the table-pump, repreſented in fig. 20. When it is wanted here, a ſmall plate is added behind, or between the barrels and receiver; and on this is ſet a ſmall tubulated (as it is termed) receiver, covering a common weather-glaſs tube.—This receiver being rarefied along with the other, the preſſure on the mercury in the ciſtern ariſing from the elaſticity of the remaining air is diminiſhed ſo as to be no longer able to ſupport the mercury at its full height; and it therefore deſcends till the height at which it ſtands puts it in equilibrio with the elaſticity. In this form, therefore, the height of the mercury is directly a meaſure of the remaining elaſticity; while in the other it meaſures the remaining unbalanced preſſure of the atmoſphere. But this gage is extremely cumberſome, and liable to accidents. We are ſeldom much intereſted in the rarefaction till it is great: a contracted form of this gage is therefore very uſeful, and was early uſed.

Fig. 20.

111 remedied. Fig. 21.

A ſyphon ABCD (fig. 21.), each branch of which is about four inches long, cloſe at A and open at D, is filled with boiling mercury till it occupies the branch AB and a very ſmall part of CD, having its ſurface at O. This is fixed to a ſmall ſtand, and fixed into the receiver, along with the things that are to be exhibited in the rarefied air. When the air has been rarefied till its remaining elaſticity is not able to ſupport the column BA, the mercury deſcends in AB, and riſes in CD, and the remaining elaſticity will always be meaſured by the elevation of the mercury in AB above that in the leg CD. Could the exhauſtion be perfected, the ſurfaces in both legs would be on a level. Another gage might be put into the ſame foot, having a ſmall bubble of air at A. This would move from the beginning of the rarefaction; but our ignorance of the analogy between the denſity and elaſticity hinders us from uſing it as a meaſure of either.

It is enough for our preſent purpoſe to obſerve, that the barometer or ſyphon gage is a perfect indication and meaſure of the performance of an air-pump, and that a pump is (*cæteris paribus*) ſo much the more perfect, as it is able to raiſe the mercury higher in the gage. It is in this way that we diſcover that none can produce a complete exhauſtion, and that their operation is only a very great rarefaction: for none can raiſe the mercury to that height at which it ſtands in the Toricellian tube, well purged of air. Few pumps will bring it within one-tenth of an inch. Hawkeſbee's, fitted up according to his inſtructions, will ſeldom bring it within one-fifth. Pumps with cocks, when conſtructed according to the principles mentioned when ſpeaking of the exhauſting ſyringe, and new and in fine order, will in favourable circumſtances bring it within one-fortieth. None with valves fitted up with wet leather, or when water or volatile fluids are allowed acceſs into any part, will bring it nearer than one-fifth. Nay, a pump of the beſt kind, and in the fineſt order, will have its rarefying power reduced to the loweſt ſtandard, as meaſured by this gage, if we put into the receiver the tenth part of a ſquare inch of white ſheep-ſkin, freſh from the ſhops, or of any ſubſtance equally damp. This is a diſcovery made by means of the improved air-pump, and leads to very extenſive and important conſequences in general phyſics; ſome of which will be treated of under this article: and the obſervation is made thus early, that our readers may better underſtand the improvements which have been made on this celebrated machine.

112 A complete exhauſtion not effected by the air-pump.

113 Various improvements of this machine.

It would require a volume to deſcribe all the changes which have been made on it. An inſtrument of ſuch multifarious uſe, and in the hands of curious men, each diving into the ſecrets of nature in his favourite line, muſt have received many alterations and real improvements in many particular reſpects. But theſe are beſide our preſent purpoſe; which is to conſider it merely as a machine for rarefying elaſtic or expanſive fluids. We muſt therefore confine ourſelves to this view of it; and ſhall carefully ſtate to our readers every improvement founded on principle, and on pneumatical laws.

114 by attempting to perfect the conſtruction of the cocks.

All who uſed it perceived the limit ſet to the rarefaction by the reſiſtance of the valves, and tried to perfect the conſtruction of the cocks. The abbé Nollet and Graveſande, two of the moſt eminent experimental philoſophers in Europe, were the moſt ſucceſsful.

115 Graveſande's improvement.

Mr Graveſande juſtly preferred Hooke's plan of a double pump, and contrived an apparatus for turning the cocks by the motion of the pump's handle. This is far from either being ſimple or eaſy in working; and occaſions great jerks and concuſſions in the whole machine. This, however, is not neceſſarily connected with the truly pneumatical improvement. His piſton has no valve, and the rod is connected with it by a ſtirrup D (fig. 22.), as in a common pump. The rod has a cylindric part *c p*, which paſſes through the ſtirrup, and has a ſtiff motion in it up and down of about half an inch; being ſtopped by the ſhoulder *c* above and the nut below. The round plate ſupported by this ſtirrup has a ſhort ſquare tube *n d*, which fits tight into the

Fig. 22.

Air-pump. the hole of a piece of cork F. The round plate E has a square shank *g*, which goes into the square tube *n d*. A piece of thin leather *f*, soaked in oil, is put between the cork and the plate E, and another between the cork and the plate which forms the sole of the stirrup. All these pieces are screwed together by the nail *e*, whose flat head covers the hole *n*. Suppose, therefore, the piston touching the bottom of the barrel, and the winch turning to raise it again, the friction of the piston on the barrel keeps it in its place, and the rod is drawn up through the stirrup D. Thus the wheel has liberty to turn about an inch; and this is sufficient for turning the cock, so as to cut off the communication with the external air, and to open the communication with the receiver. This being done, and the motion of the winch continued, the piston is raised to the top of the barrel. When the winch is turned in the opposite direction, the piston remains fixed till the cock is turned, so as to shut the communication with the receiver, and open that with the external air.

116 and manner of using it.

117 a useful contrivance. This is a pretty contrivance, and does not at first appear necessary; because the cocks might be made to turn at the beginning and end of the stroke without it. But this is just possible; and the smallest error of adjustment, or wearing of the apparatus, will cause them to be open at improper times. Besides, the cocks are not turned in an instant, and are improperly open during some very small time; but this contrivance completely obviates this difficulty.

118 The cock is precisely similar to that formerly described, having one perforation diametrically through it, and another entering at right angles to this, and after reaching the centre, it passes along the axis of the cock, and comes out to the open air.

119 Its inconveniences, It is evident, that by this construction of the cock, the ingenious improvement of Dr Hooke, by which the pressure of the atmosphere on one piston is made to balance (in great part) the pressure on the other, is given up: for, whenever the communication with the air is opened, it rushes in, and immediately balances the pressure on the upper side of the piston in this barrel; so that the whole pressure in the other must be overcome

120 remedied. by the person working the pump. Gravesande, aware of this, put a valve on the orifice of the cock; that is, tied a slip of wet bladder or oiled leather across it; and now the piston is pressed down, as long as the air in the barrel is rarer than the outward air, in the same manner as when the valve is in the piston itself.

121 Highly extolled, but This is all that is necessary to be described in Mr Gravesande's air-pump. Its performance is highly extolled by him, as far exceeding his former pumps with valves. The same preference was given to it by his successor Muschenbroek. But, while they both prepared the pistons and valves and leathers of the pump, by steeping them in oil, and then in a mixture of water and spirits of wine, we are certain that no just estimate could be made of its performance. For with this prepa-

122 limited in its operations. ration it could not bring the gage within one-fifth of an inch of the barometer. We even see other limits to its rarefaction: from its construction, it is plain that a very considerable space is left between the piston and cock, not less than an inch, from which the air is never expelled; and if this be made extremely small, it is plain that the pump must be worked very slow, otherwise there will not be time for the air to diffuse itself from the receiver into the barrel, especially towards the end, when the expelling force, viz. the elasticity of the remaining air, is very small. There is also the same limit to the rarefaction, as in Hooke's or Hawksbee's pump, opposed by the valve E, which will not open till the air below the piston is considerably denser than the external air: and this pump soon lost any advantages it possessed when fresh from the workman's hands, by the cock's growing loose and admitting air. It is surprising that Gravesande omitted Hawksbee's security against this, by placing the barrels in a dish filled with oil; which would effectually have prevented this inconvenience. Air-pump. 123 in one respect inferior to Hawksbee's.

We must not omit a seemingly paradoxical observation of Gravesande, that in a pump constructed with valves, and worked with a determined uniform velocity, the required degree of rarefaction is sooner produced by short barrels than by long ones. It would require too much time to give a general demonstration of this, but it will easily be seen by an example. Suppose the long barrel to have equal capacity with the receiver, then at the end of the first stroke the air in the receiver will have one-half its natural density. Now, let the short barrels have half this capacity: at the end of the first stroke the density of the air in the receiver is two-thirds, and at the end of the second stroke it is four-ninths, which is less than one-half, and the two strokes of the short barrel are supposed to be made in the same time with one of longest, &c. 124 Advantage of short barrels.

Hawksbee's pump maintained its pre-eminence without rival in Britain, and generally too on the continent, except in France, where every thing took the *ton* of the Academy, which abhorred being indebted to foreigners for any thing in science, till about the year 1750, when it engaged the attention of Mr John Smeaton, a person of uncommon knowledge, and second to none but Dr Hooke in sagacity and mechanical resource. He was then a maker of philosophical instruments, and made many attempts to perfect the pumps with cocks, but found, that whatever perfection he could bring them to, he could not enable them to preserve it; and he never would sell one of this construction. He therefore attached himself solely to the valve pumps. 125 Smeaton improves the valve-pump

The first thing was to diminish the resistance to the entry of the air from the receiver into the barrels: this he rendered almost nothing, by enlarging the surface on which this feebly elastic air was to press. Instead of making these valves to open by its pressure on a circle of one-twentieth of an inch in diameter, he made the valve-hole one inch in diameter, enlarging the surface 400 times; and, to prevent this piece of thin leather from being burst by the great pressure on it, when the piston in its descent was approaching the bottom of the barrel, he supported it by a delicate but strong grating, dividing the valve-hole like the section of a honey-comb, as represented in fig. 25.; and the ribs of this grating are seen edgewise in fig. 23. at *a b c*. 126 by enlarging the valve-hole, Fig. 25. Fig. 23.

The valve was a piece of thin membrane or oiled silk, gently strained over the mouth of the valve-hole, and tied on by a fine silk thread wound round it in the same manner that the narrow slips had been tied on formerly. This done, he cut with a pointed knife the leather round the edge, nearly four quadrantal arcs, leaving a small tongue between each, as in fig. 25. The strained valve immediately shrinks inwards, as represent- 127 changing the structure of the valve, and Fig. 25.

 ed

ed by the ſhaded parts; and the ſtrain by which it is kept down is now greatly diminiſhed, taking place only at the corners. The gratings being reduced nearly to an edge (but not quite, leſt they ſhould cut), there is very little preſſure to produce adheſion by the clammy oil. Thus it appears, that a very ſmall elaſticity of the air in the receiver will be ſufficient to raiſe the valve; and Mr Smeaton found, that when it was not able to do this at firſt, when only about $\frac{1}{800}$ of the natural elaſticity, it would do it after keeping the piſton up eight or ten ſeconds, the air having been all the while undermining the valve, and gradually detaching it from the grating.

128 Increaſing the expelling force. Unfortunately he could not follow this method with the piſton valve. There was not room round the rod for ſuch an expanded valve; and it would have obliged him to have a great ſpace below the valve, from which he could not expel the air by the deſcent of the piſton. His ingenuity hit on a way of increaſing the expelling force through the common valve: he incloſed the rod of the piſton in a collar of leather *l*, through which it moved freely without allowing any air to get paſt its ſides. For greater ſecurity, the collar of leather was contained in a box terminating in a cup filled with oil. As this makes a material change in the principle of conſtruction of the air-pump (and indeed of pneumatic engines in general), and as it has been adopted in all the ſubſequent attempts to improve them, it merits a particular conſideration.

129 Structure of his piſton for this purpoſe. Fig. 23. The piſton itſelf conſiſts of two pieces of braſs faſtened by ſcrews from below. The uppermoſt, which is of one ſolid piece with the rod GH (fig. 23.) is of a diameter ſomewhat leſs than the barrel; ſo that when they are ſcrewed together, a piece of leather ſoaked in a mixture of boiled oil and tallow, is put between them; and when the piſton is thruſt into the barrel from above, the leather comes up around the ſide of the piſton, and fills the barrel, making the piſton perfectly air-tight. The lower half of the piſton projects upwards into the upper, which has a hollow *g b c d* to receive it. There is a ſmall hole through the lower half at *a* to admit the air; and a hole *c d* in the upper half to let it through, and there is a ſlip of oiled ſilk ſtrained acroſs the hole *a* by way of valve, and there is room enough left at *b c* for this valve to riſe a little when preſſed from below. The rod GH paſſes through the piece of braſs which forms the top of the barrel ſo as to move freely, but without any ſenſible ſhake: this top is formed into a hollow box, conſiſting of two pieces ECDF and CNOD, which ſcrew together at CD. This box is filled with rings of oiled leather exactly fitted to its diameter, each having a hole in it for the rod to paſs through. When the piece ECDF is ſcrewed down, it compreſſes the leathers; ſqueezing them to the rod, ſo that no air can paſs between them; and, to ſecure us againſt all ingreſs of air, the upper part is formed into a cup EF, which is kept filled with oil.

The top of the barrel is alſo pierced with a hole LK, which riſes above the flat ſurface NO, and has a ſlip of oiled ſilk tied over it to act as a valve; opening when preſſed from below, but ſhutting when preſſed from above.

The communication between the barrel and receiver is made by means of the pipe ABPQ; and there goes from the hole K in the top of the barrel a pipe KRST, which either communicates with the open air or with the receiver, by means of the cock at its extremity T. The conduit pipe ABPQ has alſo a cock at Q, by which it is made to communicate either with the receiver or with the open air. Theſe channels of communication are variouſly conducted and terminated, according to the views of the maker: the ſketch in this figure is ſufficient for explaining the principle, and is ſuited to the general form of the pump, as it has been frequently made by Nairne and other artiſts in London.

130 Superiority of this conſtruction. Let us now ſuppoſe the piſton at the top of the barrel, and that it applies to it all over, and that the air in the barrel is very much rarefied: in the common pump the piſton valve is preſſed hard down by the atmoſphere, and continues ſhut till the piſton gets far down, condenſes the air below it beyond its natural ſtate, and enables it to force up the valves. But here, as ſoon as the piſton quits the top of the barrel, it leaves a void behind it; for no air gets in round the piſton rod, and the valve at K is ſhut by the preſſure of the atmoſphere. There is nothing now to oppoſe the elaſticity of the air below but the ſtiffneſs of the valve *b c*; and thus the expelling (or more accurately the liberating) force is prodigiouſly increaſed.

131 ſhown by an example. The ſuperiority of this conſtruction will be beſt ſeen by an example. Suppoſe the ſtiffneſs of the valve equal to the weight of $\frac{1}{10}$th of an inch of mercury, when the barometer ſtands at 30 inches, and that the pump-gage ſtands at 29.9; then, in an ordinary pump, the valve in the piſton will not riſe till the piſton has got within the 300th part of the bottom of the barrel, and it will leave the valve-hole filled with air of the ordinary denſity. But in this pump the valve will riſe as ſoon as the piſton quits the top of the barrel; and when it is quite down, the valve-hole *a* will contain only the 300th part of the air which it would have contained in a pump of the ordinary form. Suppoſe farther, that the barrel is of equal capacity with the receiver, and that both pumps are ſo badly conſtructed, that the ſpace left below the piſton is the 300th part of the barrel. In the common pump the piſton valve will riſe no more, and the rarefaction can be carried no farther, however delicate the barrel valve may be; but in this pump the next ſtroke will raiſe the gage to 29.95, and the piſton valve will again riſe as ſoon as the piſton gets half way down the barrel.

The limit to the rarefaction by this pump depends chiefly on the ſpace contained in the hole LK, and in the ſpace *b c d* of the piſton. When the piſton is brought up to the top, and applied cloſe to it, thoſe ſpaces remain filled with air of the ordinary denſity, which will expand as the piſton deſcends, and thus will retard the opening of the piſton valve. The rarefaction will ſtop when the elaſticity of this ſmall quantity of air, expanded ſo as to fill the whole barrel (by the deſcent of the piſton to the bottom), is juſt equal to the force requiſite for opening the piſton valve.

132 It is eaſily worked. Another advantage attending this conſtruction is, that in drawing up the piſton, we are not reſiſted by the whole preſſure of the air; becauſe the air is rarefied above this piſton as well as below it, and the piſton is in preciſely the ſame ſtate of preſſure as if connected with another piſton in a double pump. The reſiſtance to the aſcent of the piſton is the exceſs of the elaſticity of the air above it over the elaſticity of the air below:

this,

Air-pump. this, toward the end of the rarefaction, is very fmall, while the pifton is near the bottom of the barrel, but gradually increafes as the pifton rifes, and reduces the air above it into fmaller dimenfions, and becomes equal to the preffure of the atmofphere, when the air above the pifton is of the common denfity. If we fhould raife the pifton ftill farther, we muft condenfe the air above it: but Mr Smeaton has here made an iffue for the air by a fmall hole in the top of the barrel, covered with a delicate valve. This allows the air to efcape, and fhuts again as foon as the pifton begins to defcend, leaving almoft a perfect void behind it as before.

This pump has another advantage. It may be changed in a moment from a rarefying to a condenfing engine, by fimply turning the cocks at Q and T. While T communicates with the open air and Q with the receiver, it is a rarefying engine or air-pump: but when T communicates with the receiver, and Q with the open air, it is a condenfing engine.

Plate cccxxvi. fig. 26.

133 Defcription of Smeaton's pump.

Fig. 26. reprefents Mr Smeaton's air-pump as it is ufually made by Nairne. Upon a folid bafe or table are fet up three pillars F, H, H: the pillar F fupports the pump-plate A; and the pillars H, H, fupport the front or head, containing a brafs cog-wheel, which is turned by the handle B, and works in the rack C faftened to the upper end of the pifton rod. The whole is ftill farther fteadied by two pieces of brafs *c b* and *o k*, which connect the pump-plate with the front, and have perforations communicating between the hole *a* in the middle of the plate and the barrel, as will be defcribed immediately. DE is the barrel of the pump, firmly fixed to the table by fcrews through its upper flanch: *a f d c* is a flender brafs tube fcrewed to the bottom of the barrel, and to the under hole of the horizontal canal *c b*. In this canal there is a cock which opens a communication between the barrel and the receiver, when the key is in the pofition reprefented here: but when the key is at right angles with this pofition, this communication is cut off. If that fide of the key which is here drawn next to the pump-plate be turned outward, the external air is admitted into the receiver; but if turned inwards, the air is admitted into the barrel.

g h Is another flender brafs pipe, leading from the difcharging valve at *g* to the horizontal canal *h k*, to the under fide of which it is fcrewed faft. In this horizontal canal there is a cock *n* which opens a paffage from the barrel to the receiver when the key is in the pofition here drawn; but opens a paffage from the barrel to the external air when the key is turned outwards, and from the receiver to the external air when the key is turned inwards. This communication with the external air is not immediate but through a fort of box *i*; the ufe of this box is to receive the oil which is difcharged through the top valve *g*. In order to keep the pump tight, and in working order, it is proper fometimes to pour a tablefpoonful of olive oil into the hole *a* of the pump-plate, and then to work the pump. The oil goes along the conduit *b c d f e*, gets into the barrel and through the pifton-valve, when the pifton is preffed to the bottom of the barrel, and is then drawn up, and forced through the difcharging valve *g* along the pipe *g h*, the horizontal paffage *h n*, and finally into the box *i*. This box has a fmall hole in its fide near the top, through which the air efcapes.

From the upper fide of the canal *c b* there arifes a flender pipe which bends outward and then turns downwards, and is joined to a fmall box, which cannot be feen in this view. From the bottom of this box proceeds downwards the gage-pipe of glafs, which enters the ciftern of mercury G fixed below. Air-pump.

On the upper fide of the other canal at *o* is feen a fmall ftud, having a fhort pipe of glafs projecting horizontally from it, clofe by and parallel to the front piece of the pump, and reaching to the other canal. This pipe is clofe at the farther end, and has a fmall drop of mercury or oil in it at the end *o*. This ferves as a gage in condenfing, indicating the degree of condenfation by the place of the drop: For this drop is forced along the pipe, condenfing the air before it in the fame degree that it is condenfed in the barrel and receiver.

134 Method of joining together the different pipes, &c.

In conftructing this pump, Mr Smeaton introduced a method of joining together the different pipes and other pieces, which has great advantages over the ufual manner of fcrewing them together with leather between, and which is now much ufed in hydraulic and pneumatic engines. We fhall explain this to our readers by a defcription of the manner in which the exhaufting gage is joined to the horizontal duct *c b*.

The piece *h i p*, in fig. 23. is the fame with the little cylinder obfervable on the upper fide of the horizontal canal *c d*, in fig. 26. The upper part *h i* is formed into an outfide fcrew, to fit the hollow fcrew of the piece *d e e d*. The top of this laft piece has a hole in its middle, giving an eafy paffage to the bent tube *c b a*, fo as to flip along it with freedom. To the end *c* of this bent tube is foldered a piece of brafs *c f g*, perforated in continuation of the tube, and having its end ground flat on the top of the piece *h i p*, and alfo covered with a flip of thin leather ftrained acrofs it and pierced with a hole in the middle. Fig. 23. Fig. 26.

It is plain from this form, that if the furface *f g* be applied to the top of *h i*, and the cover *d e e d* be fcrewed down on it, it will draw or prefs them together, fo that no air can efcape by the joint, and this without turning the whole tube *c b a* round, as is neceffary in the ufual way. This method is now adopted for joining together the conducting pipes of the machines for extinguifhing fires, an operation which was extremely troublefome before this improvement.

The conduit pipe E *e f c* (fig. 26.) is faftened to the bottom of the barrel, and the difcharging pipe *g h* to its top, in the fame manner. But to return to the gage; the bent pipe *c b a* enters the box *s t* near one fide, and obliquely, and the gage pipe *q r* is inferted through its bottom towards the oppofite fide. The ufe of this box is to catch any drops of mercury which may fometimes be dafhed up through the gage pipe by an accidental ofcillation. This, by going through the paffages of the pump, would corrode them, and would act particularly on the joints, which are generally foldered with tin. When this happens to an air-pump, it muft be cleaned with the moft fcrupulous attention, otherwife it will be quickly deftroyed. Fig. 26.

135 Great powers of this pump. Fig. 27.

This account of Smeaton's pump is fufficient for enabling the reader to underftand its operation and to fee its fuperiority. It is reckoned a very fine pump of the ordinary conftruction which will rarefy 200 times, or raife the gage to 29.85, the barometer ftanding at 30. But Mr Smeaton found, that his pump, even after long ufing, raifed it to 29.95, which we confider as equivalent

lent to rarefying 600 times. When in fine order, he found no bounds to its rarefaction, frequently raiſing the gage as high as the barometer; and he thought its performance ſo perfect, that the barometer-gage was not ſufficiently delicate for meaſuring the rarefaction. He therefore ſubſtituted the ſyphon gage already deſcribed, which he gives ſome reaſons for preferring; but even this he found not ſufficiently ſenſible.

136 Another contrivance of Smeaton's Fig. 27.

He contrived another, which could be carried to any degree of ſenſibility. It conſiſts of a glaſs body A (fig. 27.), of a pear ſhape, and was therefore called the pear-gage. This had a ſmall projecting orifice at B, and at the other end a tube CD, whoſe capacity was the hundredth part of the capacity of the whole veſſel. This was ſuſpended at the ſlip-wire of the receiver, and there was ſet below it a ſmall cup with mercury. When the pump was worked, the air in the pear-gage was rarefied along with the reſt. When the rarefaction was brought to the degree intended, the gage was let down till B reached the bottom of the mercury. The external air being now let in, the mercury was raiſed into the pear, and ſtood at ſome height E in the tube CD. The length of this tube being divided into 100 parts, and thoſe numbered from D, it is evident that $\frac{DE}{DB}$ will expreſs the degree of rarefaction which had been produced when the gage was immerſed into the mercury: or if DC be $\frac{1}{100}$ of the whole capacity, and be divided into 100 parts by a ſcale annexed to it, each unit of the ſcale will be $\frac{1}{10000}$ of the whole.

137 very ingenious.

This was a very ingenious contrivance, and has been the means of making ſome very curious and important diſcoveries which at preſent engage the attention of philoſophers. By this gage Mr Smeaton found, that his pump frequently rarefied a thouſand, ten thouſand, nay an hundred thouſand times. But though he in every inſtance ſaw the great ſuperiority of his pump above all others, he frequently found irregularities which he could not explain, and a want of correſpondence between the pear and the barometer gages which puzzled him. The pear-gage frequently indicated a prodigious rarefaction, when the barometer-gage would not ſhow more than 600.

138 It excited the attention of the literary world.

Theſe unaccountable phenomena excited the curioſity of philoſophers, who by this time were making continual uſe of the air-pump in their meteorological reſearches, and much intereſted in every thing connected with the ſtate or conſtitution of elaſtic fluids. Mr Nairne, a moſt ingenious and accurate maker of philoſophical inſtruments, made many curious experiments in the examination and compariſon of Mr Smeaton's pump with thoſe of the uſual conſtruction, attending to every circumſtance which could contribute to the inferiority of the common pumps or to their improvement, ſo as to bring them nearer to this rival machine. This rigorous compariſon brought into view ſeveral circumſtances in the conſtitution of the atmoſpheric air, and its relation to other bodies, which are of the moſt extenſive and important influence in the operations of nature. We ſhall notice at preſent ſuch only as have a relation to the operation of the air-pump in extracting AIR from the receiver.

139 Experiments with it by Mr Nairne.

Mr Nairne found, that when a little water, or even bit of paper damped with water, was expoſed under the receiver of Mr Smeaton's air-pump, when in the moſt perfect condition, raiſing the mercury in the barometer-gage to 29.95, he could not make it riſe above 29.8 if Fahrenheit's thermometer indicated the temperature 47°, nor above 29.7 if the thermometer ſtood at 55°; and that to bring the gage to this height and keep it there, the operation of the pump muſt be continued for a long time after the water had diſappeared or the paper become perfectly dry. He found that a drop of ſpirits, or paper moiſtened with ſpirits, could not in thoſe circumſtances allow the mercury in the gage to riſe to near that height; and that ſimilar effects followed from admitting any volatile body whatever into the receiver or any part of the apparatus.

This ſhowed him at once how improper the directions were which had been given by Guericke, Boyle, Graveſande, and others, for fitting up the air-pump for experiment, by ſoaking the leather in water, covering the joints with water, or in ſhort, admitting water or any other volatile body near it. 140 ſhow the impropriety of ſoaking the leather with water,

He therefore took his pumps to pieces, cleared them of all the moiſture which he could drive from them by heat, and then leathered them anew with leather ſoaked in a mixture of olive oil and tallow, from which he had expelled all the water it uſually contains, by boiling it till the firſt frothing was over. When the pumps were fitted up in this manner, he uniformly found that Mr Smeaton's pump rarefied the gage to 29.95, and the beſt common pump to 29.87, the firſt of which he computed to indicate a rarefaction to 600, and the other to 230. But in this ſtate he again found that a piece of damp paper, leather, wood, &c. in the receiver, reduced the performance in the ſame manner as before. 141 and the utility of uſing olive oil and tallow.

But the moſt remarkable phenomenon was, that when he made uſe of the pear-gage with the pump cleared from all moiſture, it indicated the ſame degree of rarefaction with the barometer-gage: but when he expoſed a bit of paper moiſtened with ſpirits, and thus reduced the rarefaction of the pump to what he called 50, the barometer gage ſtanding at 29.4, the pear-gage indicated a rarefaction exceeding 100,000; in ſhort, it was not meaſurable; and this phenomenon was almoſt conſtant. Whenever he expoſed any ſubſtance ſuſceptible of evaporation, he found the rarefaction indicated by the barometer-gage greatly reduced, while that indicated by the pear-gage was prodigiouſly increaſed; and both theſe effects were more remarkable as the ſubject was of eaſier evaporation, or the temperament of the air of the chamber was warmer. 142 A remarkable phenomenon

This uniform reſult ſuggeſted the true cauſe. Water boils at the temperature 212, that is, it is then converted into a vapour which is permanently elaſtic while of that temperature, and its elaſticity balances the preſſure of the atmoſphere. If this preſſure be diminiſhed by rarefying the air above it, a low temperature will not allow it to be converted into elaſtic vapour, and keep it in that ſtate. Water will boil in the receiver of an air-pump at the temperature 96, or even under it. Philoſophers did not think of examining the ſtate of the vapour in temperatures lower than what produced ebullition. But it now appears, that in much lower heats than this the ſuperficial water is converted into elaſtic vapour, which continues to exhale from it as long as the water laſts, and, ſupplying the place of air in the receiver. 143 accounted for.

Air-pump. receiver, exerts the fame elafticity, and hinders the mercury from rifing in the gage in the fame manner as fo much air of equal elafticity would have done.

144 Experiments illuftrating this account. When Mr Nairne was exhibiting thefe experiments to the Honourable Henry Cavendifh in 1776, this gentleman informed him that it appeared from a feries of experiments of his father Lord Charles Cavendifh, that when water is of the temperature 72°, it is converted into vapour, under any preffure lefs than three-fourths of an inch of mercury, and at 41° it becomes vapour when the preffure is lefs than one-fourth of an inch: Even mercury evaporates in this manner when all preffure is removed. A dewy appearance is frequently obferved covering the infide of the tube of a barometer, where we ufually fuppofe a vacuum. This dew, when viewed through a microfcope, appears to be a fet of detached globules of mercury, and upon inclining the tube fo that the mercury may afcend along it, thefe globules will be all licked up, and the tube become clear. The dew which lined it was the vapour of the mercury condenfed by the fide of the tube; and it is never obferved but when one fide is expofed to a ftream of cold air from a window, &c.

To return to the vapour in the air-pump receiver, it muft be obferved, that as long as the water continues to yield it, we may continue to work the pump; and it will be continually abftracted by the barrels, and difcharged in the form of water, becaufe it collapfes as foon as expofed to the external preffure. All this while the gage will not indicate any more rarefaction, becaufe the thing immediately indicated by the barometer-gage is *diminifhed elafticity*, which does not happen here. When all the water which the temperature of the room can keep elaftic has evaporated under a certain preffure, fuppofe ½ an inch of mercury, the gage ftanding at 29.5, the vapour which now fills the receiver expands, and by its diminifhed elafticity the gage rifes, and now fome more water which had been attached to bodies by chemical or corpufcular attraction is detached, and a new fupply continues to fupport the gage at a greater height; and this goes on continually till *almoft* all has been abftracted: but there will remain fome which no art can take away; for as it paffes through the barrels, and gets between the pifton and the top, it fucceffively collapfes into water during the afcent of the pifton, and again expands into vapour when we pufh the pifton down again. Whenever this happens there is an end of the rarefaction.

145 Air and vapour not uniformly mixed together. While this operation is going on, the air comes out along with the vapour; but we cannot fay in what proportion. If it were always uniformly mixed with the vapour, it would diminifh rapidly; but this does not appear to be the cafe. There is a certain period of rarefaction in which a tranfient cloudinefs is perceived in the receiver. This is watery vapour formed at that degree of rarefaction, mingled with, but not diffolved in or united with, the air, otherwife it would be tranfparent. A fimilar cloud will appear if damp air be admitted fuddenly into an exhaufted receiver. The vapour, which formed an uniform tranfparent mafs with the air, is either fuddenly expanded and thus detached from the other ingredient, or is fuddenly let go by the air, which expands more than it does. We cannot affirm with probability which of thefe is the cafe: different compofitions of air, that is, air loaded with vapours from different fubftances, exhibit remarkable differences in this refpect. But we fee from this and other phenomena, which fhall be mentioned in their proper places, that the air and vapour are not always intimately united; and therefore will not always be drawn out together by the air-pump. But let them be ever fo confufedly blended, we fee that the air muft come out along with the vapour, and its quantity remaining in the receiver muft be prodigioufly diminifhed by this affociation, probably much more than could be, had the receiver only contained pure air.

146 Confequences of this different in the pear and barometer gages. Let us now confider what muft happen in the pear-gage. As the air and vapour are continually drawn off from the receiver, the air in the pear expands and goes off with it. We fhall fuppofe that the generated vapour hinders the gage from rifing beyond 29.5. During the continued working of the pump, the air in the pear, whofe elafticity is 0.5, flowly mixes with the vapour at the mouth of the pear, and the mixture even advances into its infide, fo that if the pumping be long enough continued, what is in the pear is nearly of the fame compofition with what is in the receiver, confifting perhaps of 20 parts of vapour and one part of air, all of the elafticity of 0.5. When the pear is plunged into the mercury, and the external air allowed to get into the receiver, the mercury rifes in the pear-gage, and leaves not $\frac{1}{60}$, but $\frac{1}{60 \times 20}$ or $\frac{1}{1200}$ of it filled with common air, the vapour having collapfed into an invifible atom of water. Thus the pear-gage will indicate a rarefaction of 1200, while the barometer-gage only fhowed 60, that is, fhowed the elafticity of the included fubftance diminifhed 60 times. The conclufion to be drawn from thefe two meafures (the one of the rarefaction of air, and the other of the diminution of elafticity) is, that the matter with which the receiver was filled, immediately before the readmiffion of the air, confifted of one part of incondenfible air, and $\frac{1200}{60}$, or 20 parts of watery vapour.

147 Difficulty in accounting for fome of thefe confequences. The only obfcure part of this account is what relates to the compofition of the matter which filled the pear-gage before the admiffion of the mercury. It is not eafy to fee how the vapour of the receiver comes in by a narrow mouth while the air is coming out by the fame paffage. Accordingly it requires a *very long time* to produce this extreme rarefaction in the pear-gage; and there are great irregularities in any two fucceeding experiments, as may be feen by looking at Mr Nairne's account of them in the Philofophical Tranfactions, vol. lxvii. Some vapours appear to have mixed much more readily with the air than others; and there are fome unaccountable cafes where vitriolic acid and fulphureous bodies were included, in which the diminution of denfity indicated by the pear-gage was uniformly lefs than the diminution of elafticity indicated by the barometer-gage. It is enough for us at prefent to have eftablifhed, by unqueftionable facts, this production of elaftic vapour, and the neceffity of attending to it, both in the conftruction of the air-pump and in drawing refults from experiments exhibited in it.

148 The fuperiority of this pump excites two new improvements. Mr Smeaton's pump, when in good order, and perfectly free from all moifture, will in dry weather rarefy air about 600 times, raifing the barometer-gage to within

Air-pump. in $\frac{1}{25}$ of an inch of a fine barometer. This was a performance ſo much ſuperior to that of all others, and by means of Mr Nairne's experiments opened ſo new a field of obſervation, that the air-pump once more became a capital inſtrument among the experimental philoſophers. The cauſes of its ſuperiority were alſo ſo diſtinct, that artiſts were immediately excited to a farther improvement of the machine; ſo that this becomes a new epoch in its hiſtory.

149 Improvements in this pump attempted.

There is one imperfection which Mr Smeaton has not attempted to remove. The diſcharging valve is ſtill opened againſt the preſſure of the atmoſphere. An author of the Swediſh academy adds a ſubſidiary pump to this valve, which exhauſts the air from above it, and thus puts it in the ſituation of the piſton valve. We do not find that this improvement has been adopted ſo as to become general. Indeed the quantity of air which remains in the paſſage to this valve is ſo exceedingly little, that it does not ſeem to merit attention. Suppoſing the valve hole $\frac{1}{20}$ of an inch wide and as deep (and it need not be more), it will not occupy more than $\frac{1}{7000}$ part of a barrel twelve inches long and two inches wide.

150 Mr Smeaton, by his ingenious conſtruction, has greatly diminiſhed, but has not annihilated, the obſtructions to the paſſage of the air from the receiver into the barrel. His ſucceſs encouraged farther attempts. One of the firſt and moſt ingenious was that of Profeſſor Ruſſel of the univerſity of Edinburgh, who about the year 1770 conſtructed a pump in which both cocks and valves were avoided.

151 by Ruſſel, Fig. 28.

The piſton is ſolid, as repreſented in fig. 28. and its rod paſſes through a collar of leather on the top of the barrel. This collar is divided into three portions by two braſs rings *a*, *b*, which leave a very ſmall ſpace round the piſton rod. The upper ring *a* communicates by means of a lateral perforation with the bent tube *l m n*, which enters the barrel at its middle *n*. The lower ring *b* communicates with the bent tube *c d*, which communicates with the horizontal paſſage *d e*, going to the middle *e* of the pump plate. By the way, however, it communicates alſo with a barometer gage *p o*, ſtanding in a ciſtern of mercury *o*, and covered with a glaſs tube cloſe at the top. Beyond *e*, on the oppoſite circumference of the receiver plate, there is a cock or plug *f* communicating with the atmoſphere.

The piſton rod is cloſely embraced by the three collars of leather; but, as already ſaid, has a free ſpace round it in the two braſs rings. To produce this preſſure of the leathers to the rod, the braſs rings which ſeparate them are turned thinner on the inner ſide, ſo that their croſs ſection along a diameter would be a taper wedge. In the ſide of the piſton rod are two cavities *q r*, *t s*, about one-tenth of an inch wide and deep, and of a length equal to the thickneſs of the two rings *a*, *b*, and the intermediate collar of leathers. Theſe cavities are ſo placed on the piſton-rod, that when the piſton is applied to the bottom of the barrel, the cavity *t s* in the upper end of the rod has its upper end oppoſite to the ring *a*, and its lower end oppoſite to the ring *b*, or to the mouth of the pipe *c d*. Therefore, if there be a void in the barrel, the air from the receiver will come from the pipe *cd*, into the cavity in the piſton rod, and by it will get paſt the collar of leather between the rings, and thus will get into the ſmall interſtice between the rod and the upper ring, and then into the pipe *l m n*, and into the empty barrel. When the piſton is drawn up, the ſolid rod immediately ſhuts up this paſſage, and the piſton drives the air through the diſcharging valve *k*. When it has reached the top of the barrel, and is cloſely applied to it, the cavity *q r* is in the ſituation in which *t s* formerly was, and the communication is again opened between the receiver and the empty barrel, and the air is again diffuſed between them. Puſhing down the piſton expels the air by the lower diſcharging pipe and valve *h i*; and thus the operation may be continued.

This muſt be acknowledged to be a moſt ſimple and ingenious conſtruction, and can neither be called a cock nor a valve. It ſeems to oppoſe no obſtruction whatever: and it has the ſuperior advantage of rarefying both during the aſcent and the deſcent of the piſton, doubling the expedition of the performance, and the operator is not oppoſed by the preſſure of the atmoſphere except towards the end of each ſtroke. The expedition, however, is not ſo great as one ſhould expect; for nothing is going on while the piſton is in motion, and the operator muſt ſtop a while at the end of each ſtroke, that the air may have time to come through this long, narrow, and crooked paſſage, to fill the barrel. But the chief difficulty which occurred in the execution aroſe from the clammy oil with which it was neceſſary to impregnate the collar of leathers. Theſe were always in a ſtate of ſtrong compreſſion, that they might cloſely graſp the piſton rod, and prevent all paſſage of air during the motion of the piſton. Whenever therefore the cavities in the piſton rod come into the ſituations neceſſary for connecting the receiver and barrel, this oil is ſqueezed into them, and chokes them up. Hence it always happened that it was ſome time after the ſtroke before the air could force its way round the piſton rod, carrying with it the clammy oil which choked up the tube *l m n*; and when the rarefaction had proceeded a certain length, the diminiſhed elaſticity of the air was not able to make its way through theſe obſtructions. The death of the ingenious author put a ſtop to the improvements by which he hoped to remedy this defect, and we have not heard that any other perſon has ſince attempted it. We have inſerted it here, becauſe its principle of conſtruction is not only very ingenious, but entirely different from all others, and may furniſh very uſeful hints to thoſe who are much engaged in the conſtruction of pneumatic engines.

152 By Haas and Hurter.

In the 73d volume of the Philoſophical Tranſactions, Mr Tiberius Cavallo has given the deſcription of an air-pump contrived and executed by Meſſrs Haas and Hurter, inſtrument-makers in London, where theſe artiſts have revived Guericke's method of opening the barrel-valve during the laſt ſtrokes of the pump by a force acting from without. We ſhall inſert ſo much of this deſcription as relates to this diſtinguiſhing circumſtance of its conſtruction.

Fig. 29. represents a ſection of the bottom of the barrel, where AA is the barrel and BB the bottom, which has in its middle a hollow cylinder CCFF, projecting about half an inch into the barrel at CC, and extending a good way downwards to FF. The ſpace between this projection and the ſides of the barrel is filled up by a braſs ring DD, over the top of which is ſtrained a piece of oiled ſilk EE, which performs the office of a valve, covering the hole CC. But this hole is filled up by a piece

Air-pump. piece of brass, or rather an assemblage of pieces screwed together GGHHII. It consists of three projecting fillets or shoulders GG, HH, II, which form two hollows between them, and which are filled with rings of oiled leather OO, PP, firmly screwed together. The extreme fillets GG, II, are of equal diameter with the inside of the cylinder, so as to fill it exactly, and the whole stuffed with oiled leather, slide up and down without allowing any air to pass. The middle fillet HH is not so broad, but thicker. In the upper fillet GG there is formed a shallow dish about $\frac{1}{7}$ of an inch deep and $\frac{1}{2}$ wide. This dish is covered with a thin plate, pierced with a grating like Mr Smeaton's valve-plate. There is a perforation VX along the axis of this piece, which has a passage out at one side H, through the middle fillet. Opposite to this passage, and in the side of the cylinder CCFF, is a hole M, communicating with the conduit pipe MN, which leads to the receiver. Into the lower end of the perforation is screwed the pin KL, whose tail L passes through the cap FF. The tail L is connected with a lever RQ, moveable round the joint Q. This lever is pushed upwards by a spring, and thus the whole piece which we have been describing is kept in contact with the slip of oiled silk or valve EE. This is the usual situation of things.

153 Now suppose a void formed in the barrel by drawing up the piston; the elasticity of the air in the receiver, in the pipe NM, and in the passage XV, will press on the great surface of the valve exposed through the grating, will raise it, and the pump will perform precisely as Mr Smeaton's does. But suppose the rarefaction to have been so long continued, that the air is no longer able to raise the valve; this will be seen by the mercury rising no more in the pump-gage. When this is perceived, the operator must press with his foot on the end R of the lever RQ. This draws down the pin KL, and with it the whole hollow plug with its grated top. And thus, instead of raising the valve from its plate, the plate is here drawn down from the valve. The air now gets in without any obstruction whatever, and the rarefaction proceeds as long as the piston rises. When it is at the top of the barrel, the operator takes his foot from the lever, and the spring presses up the plug again and shuts the valve. The piston rod passes through a collar of leather, as in Mr Smeaton's pump, and the air is finally discharged through an outward valve in the top of the barrel. These parts have nothing peculiar in them.

This is an ingenious contrivance, similar to what was adapted by Guericke himself; and we have no doubt of these pumps performing extremely well if carefully made: and it seems not difficult to keep the plug perfectly air-tight by supplying plenty of oil to the leathers. We cannot say, however, with precision what may be expected from it, as no account has been given of its effects besides what Mr Cavallo published in Philosophical Transactions 1783, where he only says, that when it had been long used, it had, in the course of some experiments, rarefied 600 times.

154 by Prince, Aiming still at the removing the obstructions to the entry of the air from the receiver into the barrels, Mr Prince, an American, has constructed a pump in which there is no valve or cock whatever between them. In this pump the piston rod passes through a collar of leathers, and the air is finally discharged through a valve, as in the two last. But we are chiefly to attend, in this place, to the communication between the barrel and the Air-pump. receiver. The barrel widens below into a sort of cistern ABCD (fig. 30.), communicating with the receiver by Fig. 30. the pipe EF. As soon, therefore, as the piston gets into this wider part, where there is a vacancy all round it, the air of the receiver expands freely through the passage FEE into the barrel, in which the descent of the piston had made a void. When the piston is again drawn up, as soon as it gets into the cylindric part of the barrel, which it exactly fills, it carries up the air before it, and expels it by the top valve; and, that this may be done more completely, this valve opens into a second barrel or air-pump whose piston is rising at the same time, and therefore the valve of communication (which is the discharging valve of the primary pump) opens with the same facility as Mr Smeaton's piston valve. While the piston is rising, the air in the receiver expands into the barrel; and when the piston descends, the air in the barrel again collapses till the piston gets again into the cistern, when the air passes out, and fills the evacuated barrel, to be expelled by the piston as before.

No distinct account has as yet been given of the performance of this pump. We only learn that great inconveniences were experienced from the oscillations of the mercury in the gage. As soon as the piston comes into the cistern, the air from the receiver immediately rushes into the barrel, and the mercury shoots up in the gage, and gets into a state of oscillation. The subsequent rise of the piston will frequently keep time with the second oscillation, and increase it. The descent of the piston produces a downward oscillation, by allowing the air below it to collapse; and, by improperly timing the strokes, this oscillation becomes so great as to make the mercury enter the pump. To prevent this, and a greater irregularity of working as a condenser, valves were put in the piston: but as these require force to open them, the addition seemed rather to increase the evil, by rendering the oscillations more simultaneous with the ordinary rate of working. If this could be got over, the construction seems very promising.

It appears, however, of very difficult execution. It has many long, slender, and crooked passages, which must be drilled through broad plates of brass, some of them appearing scarcely practicable. It is rare to find plates and other pieces of brass without air-holes, which it would be very difficult to find out and to close; and it must be very difficult to clear it of obstructions; so that it appears rather a suggestion of theory than a thing warranted by its actual performance.

Mr Lavoisier, or some of the naturalists who were 155 by Lavoisier, occupied in concert with him in the investigation of the different species of gas which are disengaged from bodies in the course of chemical operations, has contrived an air-pump which has great appearance of simplicity, and, being very different from all others, deserves to be taken notice of.

It consists of two barrels *l*, *m*, fig. 31. with solid pi- Fig. 31. stons *k k*. The pump-plate *a b* is pierced at its centre *c* with a hole which branches towards each of the barrels, as represented by *c d*, *c e*. Between the plate and the barrels slides another plate *h i*, pierced in the middle with a branched hole *f d g*, and near the ends with two holes *h h*, *i i*, which go from its under side to the ends. The holes in these two plates are so adjusted, that when the plate *h i* is drawn so far towards *h* that the hole *i* comes

Air-pump. within the barrel *m*, the branch *d f* of the hole in the middle plate coincides with the branch *c d* of the upper plate, and the holes *e*, *g* are shut. Thus a communication is established between the barrel *l* and the receiver on the pump-plate, and between the barrel *m* and the external air. In this situation the barrel *l* will exhaust, and *m* will discharge. When the piston of *l* is at its mouth, and that of *m* touches its bottom, the sliding plate is shifted over to the other side, so that *m* communicates with the receiver through the passage *g d*, *e c*, and *l* communicates with the air by the passages *h h*.

It is evident that this sliding plate performs the office of four cocks in a very beautiful and simple manner, and that if the pistons apply close to the ends of the barrels, so as to expel the whole air, the pump will be perfect. It works, indeed, against the whole pressure of the external air. But this may be avoided by putting valves on the holes *h*, *i*; and these can do no harm, because the air remaining in them never gets back into the barrel till the piston be at the farther end, and the exhaustion of that stroke completed. But the best workmen of London think that it will be incomparably more difficult to execute this cock (for it is a cock of an unusual form), in such a manner that it shall be air-tight and yet move with tolerable ease, and that it is much more liable to wearing loose than common cocks. No accurate accounts have been received of its performance. It must be acknowledged to be ingenious, and it may suggest to an intelligent artist a method of combining common conical cocks upon one axis so as to answer the same purposes much more effectually; for which reason we have inserted it here.

156 and by Cuthbertson. The last improvement which we shall mention is that published by Mr Cuthberson, philosophical instrument-maker in Amsterdam, now of London. His pump has given such evidences of its perfection, that we can hardly expect or wish for any thing more complete. But we must be allowed to observe, beforehand, that the same construction was invented, and, in part, executed before the end of 1779, by Dr Daniel Rutherford, now professor of botany in the university of Edinburgh, who was at that time engaged in experiments on the production of air during the combustion of bodies in contact with nitre, and who was vastly desirous of procuring a more complete abstraction of pure aerial matter than could be effected by Mr Smeaton's pump. The compiler of this article had then an opportunity of perusing the Doctor's dissertation on this subject, which was read in the Philosophical Society of Edinburgh. In this dissertation the Doctor appears fully apprised of the existence of pure vital air in the nitrous acid, as its chief ingredient, and as the cause of its most remarkable phenomena, and to want but a step to the discoveries which have ennobled the name of Mr Lavoisier. He was particularly anxious to obtain *apart* this distinguishing ingredient in its composition, and, for this purpose, to abstract completely from the vessel in which he subjected it to examination every particle of elastic matter. The writer of this article proposed to him to cover the bottom of Mr Smeaton's piston with some clammy matter, which should take hold of the bottom valve, and *start it* when the piston was drawn up. A few days after, the Doctor showed him a drawing of a pump, having a conical metal valve in the bottom, furnished with a long slender wire, sliding in the inside of the piston-rod with a gentle friction, sufficient for lifting the valve, and secured against all chance of failure by a spring a-top, which took hold of a notch in the inside of the piston-rod about a quarter of an inch from the lower end, so as certainly to lift the valve during the last quarter of an inch of the piston's motion. Being an excellent mechanic, he had executed a valve on this principle, and was fully satisfied with its performance. But having already confirmed his doctrines respecting the nitrous acid by incontrovertible experiments, his wishes to improve the air-pump lost their incitement, and he thought no more of it; and not long after this, the ardour of the philosophers of the Teylerian Society at Haerlem and Amsterdam excited the efforts of Mr Cuthbertson, their instrument-maker, to the same purpose, and produced the most perfect air-pump that has yet appeared. We shall give a description of it, and an account of its performance, in the inventor's own words.

Cuthbertson's Air-pump.

On Plate CCCCXXVII. fig. 32. is a perspective view of this pump, with its two principal gages screwed into their places. These need not be used together, except in cases where the utmost exactness is required. In common experiments one of them is removed, and a stop-screw put in its place. When the pear-gage is used, a small round plate, on which the receiver may stand, must be first screwed into the hole at A; but this hole is stopped on other occasions with a screw. When all the three gages are used, and the receiver is exhausted, the stop-screw B, at the bottom of the pump, must be unscrewed, to admit the air into the receiver; but when they are not all used, either of the other stop-screws will answer this purpose. 157 Fig. 32.

Fig. 33. represents a cross-bar for preventing the barrels from being shaken by working the pump or by any accident. Its place in fig. 32. is represented by the dotted lines. It is confined in its place, and kept close down on the barrels, by two slips of wood NN, which must be drawn out, as well as the screws OO, when the pump is to be taken asunder. Fig. 33.

Plate CCCCXXVIII. exhibits a section of all the working parts of the pump, except the wheel and rack, in which there is nothing uncommon.

Fig. 34. is a section of one of the barrels, with all its internal parts; and figs. 35. 36. 37. and 38. are different parts of the piston, proportioned to the size of the barrel (A) and to one another.

In fig. 34. CD represents the barrel, F the collar of leathers, G a hollow cylindrical vessel to contain oil, R is also an oil-vessel to receive the oil which is drawn, along with the air, through the hole *a a*, when the piston is drawn upwards; and, when this is full, the oil is carried over with the air, along the tube T, into the oil-vessel G. *c c* is a wire which is driven upwards from the Fig. 34.

(A) The piston and barrel are 1.65 inches in diameter, in proportion to which the scale is drawn. Figures 35 36. 37. and 38. are, however, of double size.

the hole *a a* by the paſſage of the air; and as ſoon as this has eſcaped, it falls down again by its own weight, ſhuts up the hole, and prevents all return of the air into the barrel. At *d d* are fixed two pieces of braſs, to keep the wire *c c* in a vertical direction, that it may accurately ſhut the hole. H is a cylindrical wire or rod which carries the piſton I, and is made hollow to receive a long wire *g g*, which opens and ſhuts the hole L; and on the other end of the wire O is ſcrewed a nut, which, by ſtopping in the narroweſt part of the hole, prevents the wire from being driven up too far. This wire and ſcrew are more clearly ſeen in fig. 35. and 39.; they ſlide in a collar of leather *r r*, fig. 35. and 38. in the middle piece of the piſton. Fig. 37. and 38. are the two mean parts which compoſe the piſton, and, when the pieces 36. and 39. are added to it, the whole is repreſented by fig. 35. Fig. 38. is a piece of braſs of a conical form, with a ſhoulder at the bottom. A long hollow ſcrew is cut in it, about two-thirds of its length, and the remainder of the hole, in which there is no ſcrew, is of about the ſame diameter with the ſcrewed part, except a thin plate at the end, which is of a width exactly equal to the thickneſs of *g g*. That part of the inſide of the conical braſs in which no thread is cut, is filled with oiled leathers with holes through which *g g* can ſlide ſtiffly. There is alſo a male ſcrew with a hole in it, fitted to *g g*, ſerving to compreſs the leathers *r r*. In fig. 37. *a a a a* is the outſide of the piſton, the inſide of which is turned ſo as exactly to fit the outſide of fig. 38. *b b* are round leathers about 60 in number, *c c* is a circular piece of braſs of the ſize of the leathers, and *d d* is a ſcrew ſerving to compreſs them. The ſcrew at the end of fig. 36. is made to fit the ſcrew in fig. 38. Now if fig. 39. be puſhed into fig. 38. this into fig. 37. and fig. 36. be ſcrewed into the end of fig. 38. theſe will compoſe the whole of the piſton, as repreſented in fig. 34. H in fig. 34. repreſents the ſame part as H in fig. 35. and is that to which the rack is fixed. If, therefore, this be drawn upwards, it will cauſe fig. 38. to ſhut cloſe into fig. 37. and drive out the air above it; and when it is puſhed downward, it will open as far as the ſhoulder *a a* will permit, and ſuffer air to paſs

Fig. 40. through. AA, fig. 40. is the receiver plate, BB is a long ſquare piece of braſs, ſcrewed into the under ſide of the plate, through which a hole is drilled correſponding to that in the centre of the receiver-plates and with three female ſcrews *b*, *b*, *c*.

The rarefaction of the air in the receiver is effected as follows. Suppoſe the piſton at the bottom of the barrel. The inſide of the barrel, from the top of the pi-

Fig. 34. ſton to *a*, fig. 34. contains common air. When the rod is drawn up, the upper part of the piſton ſticks faſt in the barrel till the conical part connected with the rod ſhuts the conical hole, and its ſhoulder applies cloſe to its botton. The piſton is now ſhut, and therefore the *whole* is drawn up by the rack-work, driving the air before it through the hole *a c*, into the oil-veſſel at R, and out into the room by the tube T. The piſton will then be at the top of the barrel at *a*, and the wire *g g* will ſtand nearly as repreſented in the figure juſt raiſed from the hole L, and prevented from riſing higher by the nut O. During this motion the air will expand in the receiver, and come along the bent tube *m* into the barrel. Thus the barrel will be filled with air, which, as the piſton riſes, will be rarefied in proportion as the capacity of the receiver pipes, and barrel, is to the barrel alone. When the piſton is moved down again by the rack-work, it will force the conical part fig. 38. out of the hollow part fig. 37. as far as the ſhoulders *a a*; fig. 35. will reſt on *a a* fig. 37. which will then be ſo far open as to permit the air to paſs freely through it, while at the ſame time the end of *g g* is forced againſt the top of the hole, and ſhuts it in order to prevent any air from returning into the receiver. Thus the piſton, moving downwards, ſuffers the air to paſs out between the ſides of fig. 37. and 38.; and, when it is at the bottom of the barrel, will have the column of air above it; and, conſequently, when drawn upwards it will ſhut, and drive out this air, and, by opening the hole L at the ſame time, will give a free paſſage to more air from the receiver. This proceſs being continued, the air of the receiver will be rarefied *as far as its expanſive power will permit*. For in this machine there are no valves to be forced open by the elaſticity of the air in the receiver, which at laſt it is unable to effect. There is therefore nothing to prevent the air from expanding to its utmoſt degree.

It may be ſuſpected here, that as the air muſt eſcape through the diſcharging paſſage *a c*, fig. 34. againſt the preſſure of a column of oil and the weight of the wire, there will remain in this paſſage a quantity of air of conſiderable denſity, which will expand again into the barrel during the deſcent of the piſton, and thus put a ſtop to the progreſs of rarefaction. This is the caſe in Mr Smeaton's pump, and all which have valves in the piſton. But it is the peculiar excellency of this pump, that whatever be the denſity of the air remaining in *a c*, the rarefaction will ſtill go on. It is worth while to be perfectly convinced of this. Let us ſuppoſe that the air contained in *a c* is $\frac{1}{100}$th part of the common air which would fill the barrel, and that the capacity of the barrel is equal to that of the receiver and paſſages, and that the air in the receiver and barrel is of the ſame denſity, the piſton being at the bottom of the barrel: The barrel will therefore contain $\frac{10}{1000}$ parts of its natural quantity, and the receiver $\frac{10}{1000}$. Now let the piſton be drawn up. No air will be diſcharged at *a c*, becauſe it will contain the whole air which was in the barrel, and which has now collapſed into its ordinary bulk. But this does not in the leaſt hinder the air of the receiver from expanding into the barrel, and diffuſing itſelf equally between both. Each will now contain $\frac{5}{1000}$ of their ordinary quantity when the piſton is at the top, and *a c* will contain $\frac{1}{100}$ as before, or $\frac{10}{1000}$. Now puſh down the piſton. The hole L is inſtantly ſhut, and the air in *a c* expands into the barrel, and the barrel now contains $\frac{15}{1000}$. When the piſton has reached the bottom, let it be again drawn up. There will be $\frac{5}{1000}$ diſcharged through *c*, and the air in the receiver will again be equally diſtributed between it and the barrel. Therefore the receiver will now contain $\frac{2\frac{1}{2}}{1000}$. When the piſton reaches the bottom, there will be $\frac{12\frac{1}{2}}{1000}$ in the barrel. When again drawn up to the top, there will be $\frac{2\frac{1}{2}}{1000}$ diſcharged, and the receiver will contain $\frac{1\frac{1}{4}}{1000}$; and when the piſton reaches

Air-pump.

reaches the bottom, there will be $\frac{1\frac{1}{3}}{1000}$. At the next stroke the receiver will contain only $\frac{0.\frac{1}{11}}{1000}$, &c. &c.

Thus it appears, that notwithstanding the $\frac{10}{1000}$ which always expands back again out of the hole $a\,c$ into the barrel, the rarity of the air in the receiver will be doubled at every stroke. There is therefore no need of a subsidiary air-pump at *c*, as in the American air-pump, and in the Swedish attempt to improve Smeaton's.

In using this air-pump no particular directions are necessary, nor is any peculiar care necessary for keeping it in order, except that the oil-vessel A be always kept about half full of oil. When the pump has stood long without being used, it will be proper to draw a table-spoonful of olive-oil through it, by pouring it into the hole in the middle of the receiver-plate when the piston is at the bottom of the barrel. Then by working the piston, the oil will be drawn through all the parts of the pump, and the surplus will be driven through the tube T into the oil-vessel G. Near the top of the piston-rod at H there is a hole which lets some oil into the inside of the rod, which gets at the collar of leathers *r r*, and keeps the wire *g g* air-tight.

When the pump is used for condensation at the same time that it rarefies, or separately, the piece containing the bent tube T must be removed, and fig. 41. put into

Fig. 41. its place, and fixed by its screws. Fig. 41. as drawn in the plate, is intended for a double-barrelled pump. But for a single barrel only one piece is used, represented by *b a a*, the double piece being cut off at the dotted line *a a*. In this piece is a female screw to receive the end of a long brass tube, to which a bladder (if sufficient for the experiment of condensation), or a glass, properly secured for this purpose, must be screwed. Then the air which is abstracted from the receiver on the pump-plate will be forced into the bladder or glass. But if the pump be double, the apparatus fig. 41. is used, and the long brass tube screwed on at *c*.

Fig. 42. and 43. Fig. 42. and 43. represent the two gages, which will be sufficiently explained afterwards. Fig. 42 is screwed into *c b*, or into the screw at the other end of *c*. fig. 40. and fig. 43. into the screw *a b* fig. 40.

If it be used as a single pump, either to rarefy or condense, the screw K, which fastens the rack to the piston-rod H, must be taken out. Then turning the winch till H is depressed as low as possible, the machine will be fitted to exhaust as a single pump; and if it be required to condense, the direction in N° 8. must be observed with regard to the tube T, and fig. 41.

"I took (says Mr Cuthbertson) two barometer-tubes of an equal bore with that fixed to the pump. These were filled with mercury four times boiled. They were then compared, and stood exactly at the same height. The mercury in one of them was boiled in it four times more, without making any change in their height; they were therefore judged very perfect. One of these was immersed in the cistern of the pump-gage, and fastened in a position parallel to it, and a sliding scale of one inch was attached to it. This scale, when the gage is used, must have its upper edge set equal with the surface of the mercury in the boiled tube after exhaustion, and the

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difference between the height of the mercury in this and in the other barometer tube may be observed to the $\frac{1}{150}$ of an inch; and being close together, no error arises from their not being exactly vertical, if they are only parallel. This gage will be better understood by inspecting fig. 43.

"I used a second gage, which I shall call a double syphon. See fig. 42. This was also prepared with the utmost care. I had a scale for measuring the difference between the height of the columns in the two legs. It was an inch long, and divided as the former, and kept in a truly vertical position by suspending it from a point with a weight hung to it, as represented in the figure. Upon comparing these two gages, I always found them to indicate the same degree of rarefaction. I also used a pear-gage, though the most imperfect of all, in order to repeat the curious experiments of Mr Nairne and others."

When experiments require the utmost rarefying power of the pump, the receiver must not be placed on leather, either oiled or soaked in water, as is usually done. The pump-plate and the edge of the receiver must be ground very flat and true, and this with very fine emery, that no roughness may remain. The plate of the pump must then be wiped very clean and very dry, and the receiver rubbed with a warm cloth till it become electrical. The receiver being now set on the plate, hog's lard, either alone or mixed with a little oil, which has been cleared of water by boiling, must be smeared round its outside edge. In this condition the pump will rarefy its utmost, and what still remains in the receiver will be permanent air. Or a little of this composition may be thinly smeared on the pump-plate; this will prevent all risk of scratching it with the edge of the receiver. Leather of very uniform thickness, long dried before a fire, and well soaked in this composition, which must be cleared of all water by the first boiling, will answer very well, and is expeditious, when receivers are to be frequently shifted. Other leathers should be at hand soaked in a composition containing a little rosin. This gives it a clamminess which renders it impermeable to air, and is very proper at all joints of the pump, and all apparatus for pneumatic experiments. As it is impossible to render the pear-gage as dry as other parts of the apparatus, there will be generally some variation between this and the other gages.

When it is only intended to show the utmost power of the pump, without intending to ascertain the quality of the residuum, the receiver may be set on wet leather. If, in this condition, the air be rarefied as far as possible, the syphon and barometer gage will indicate a less degree of rarefaction than in the former experiments. But when the air is let in again, the pear-gage will point out a rarefaction some thousands of times greater than it did before. If the true quality of permanent air after exhaustion be required, the pear-gage will be nearest the truth: for when the air is rarefied to a certain degree, the moistened leather emits an expansible fluid, which, filling the receiver, forces out the permanent air; and the two first gages indicate a degree of exhaustion which relates to the whole elastic matter remaining in the receiver, viz. to the expansible fluid together with the permanent air; whereas the pear-gage points out the degree of exhaustion, with

relation

Air-pump. relation to the permanent air alone, which remains in the receiver; for by the pressure of the air admitted into the receiver, the elastic vapour is reduced to its former bulk, which is imperceptible.

Many bodies emit this elastic fluid when the pressure of the air is much diminished; a piece of leather, in its ordinary damp state, about an inch square, or a bit of green or dry wood, will supply this for a great while.

When such fluids have been generated in any experiments, the pump must be carefully cleared of them, for they remain not only in the receiver, but in the barrels and passages, and will again expand when the exhaustion has been carried far.

The best method of clearing the pump is to take a very large receiver, and, using every precaution to exhaust it as far as possible. Then the expansible matter lurking in the barrels and passes will be diffused through the receiver also, or will be carried off along with its air. It will be as much rarer than it was before, as the aggregate capacity of the receiver barrels and passes is larger than that of the two last.

The performance of the pump may be judged of from the four following experiments.

The two gages being screwed into their places, and the hole in the receiver-plate shut up, the pump was made to exhaust as far as it could. The mercury in the legs of the syphon was only $\frac{1}{40}$ of an inch out of the level, and that in the boiled barometer-tube $\frac{1}{40}$ of an inch higher than in the one screwed to the pump. A standard barometer then stood at 30 inches, and therefore the pump rarefied the permanent air 1200 times. This is twice as much as Mr Nairne found Mr Smeaton's do in its best state. Mr Cavallo seems disposed to give a favourable (while we must suppose it a just) account of Haas and Hurter's pump, and it appears never to have exceeded 600 times. Mr Cuthbertson has often found the mercury within $\frac{1}{100}$ of an inch of the level in the syphon-gage, indicating a rarefaction of 3000.

To the end of a glass tube, 2 inches diameter and 30 inches long, was fitted a brass cap and collar of leather, through which a wire was inserted, reaching about two inches within the tube. This was connected with the conductor of an electric machine. The other end was ground flat and set on the pump plate. When the gages indicated a rarefaction of 3000, the light became steady and uniform, of a pale colour, though a little tinged with purple; at 600 the light was of a pale dusky white; when 1200 it disappeared in the middle of the tube, and the tube conducted so well that the prime conductor only gave sparks so faint and short as to be scarcely perceptible. After taking off the tube, and making it as dry as possible, it was again connected with the conductor, which was giving sparks two inches long. When the air in it was rarefied ten times, the sparks were of the same length. Sometimes a pencil of light darted along the tube. When the rarefaction was 20, the spark did not exceed an inch, and light streamed the whole length of the tube. When the rarefaction was 30, the sparks were half an inch, and the light rushed along the tube in great streams. When the rarefaction was 100, the sparks were about $\frac{1}{8}$ long, and the light filled the tube in an uninterrupted body. When 300, the appearances were as before. When 600, the sparks were $\frac{1}{16}$, and the light was of a faint white colour in the middle, but tinged with purple towards the ends. When 1200, the light was hardly perceptible in the middle, and was much fainter at the ends than before, but still ruddy. When 1400, which was the most the pump could produce, six inches of the middle of the tube were quite dark, and the ends free of any tinge of red, and the sparks did not exceed $\frac{1}{20}$ of an inch.

158 The best improvements of the air-pump have been made in Britain.

We trust that our readers will not be displeased with the preceding history of the air-pump. The occasional information which it gives will be of great use to every person much engaged in pneumatic experiments, and help him in the contrivance and construction of the necessary apparatus.

We may be indulged in one remark, that although this noble instrument originated in Germany, all its improvements were made in this kingdom. Both the mechanical and pneumatical principles of Mr Boyle's construction were extremely different from the German, and, in respect of expedition and conveniency, much superior. The double barrel and gage by Hawkesbee were capital improvements, and on principle; and Mr Smeaton's method of making the piston work in rarefied air made a complete change in the whole process.

159 Utility of the air-pump.

Aided by this machine, we can make experiments establishing and illustrating the gravity and elasticity of the air, in a much more perspicuous manner than could be done by the spontaneous phenomena of nature.

160 Experiments to show this utility.

It allows us in the first place to show the materiality of air in a very distinct manner. Bodies cannot move about in the atmosphere without displacing it. This requires force; and the resistance of the air always diminishes the velocity of bodies moving in it. A heavy body therefore has the velocity of its fall diminished; and if the quantity of air displaced be very great, the diminution will be very considerable. This is the reason why light bodies, such as feathers, fall very slowly. Their moving force is very small, and can therefore displace a great quantity of air only with a very small velocity. But if the same body be dropped *in vacuo*, when there is no air to be displaced, it falls with the whole velocity competent to its gravity. Fig. 44. represents an apparatus by which a guinea and a downy feather are dropped at the same instant, by opening the forceps which holds them by means of the slip-wire in the top of the receiver. If this be done after the air has been pumped out, the guinea and the feather will be observed to reach the bottom at the same instant. (Plate CCCCXXIX. fig. 44.)

161 Fig. 45.

Fig. 45. represents another apparatus for showing the same thing. It consists of two sets of brass vanes put in separate axles, in the manner of windmill sails. One set has their edges placed in the direction of their whirling motion, that is, in a plane to which the axis is perpendicular. The planes of the other set pass through the axis, and they are therefore trimmed so as directly to front the air through which they move. Two springs act upon pins projecting from the axis; and their strength or tensions are so adjusted, that when they are disengaged *in vacuo*, the two sets continue in motion equally long. If they are disengaged in the air, the vanes which beat the air with their planes will stop long before those which cut it edgewise.

162 We can now abstract the air most completely from

a

Air-pump. a dry veſſel, ſo as to know the preciſe weight of the air which filled it. The firſt experiment we have of this kind, done with accuracy, is that of Dr Hooke, February 10. 1664, when he found 114 pints of air to weigh 945 grains. One pint of water was $8\frac{7}{12}$ ounces. This gives for the ſpecific gravity of air $\frac{1}{870}$ very nearly.

163 The effect of air on the weight of bodies immerſed in it. Since we are thus immerſed in a gravitating fluid, it follows, that every body preponderates only with the exceſs of its own weight above that of the air which it diſplaces; for every body loſes by this immerſion the weight of the diſplaced air. A cubic foot loſes about 521 grains in froſty weather. We ſee balloons even riſe in the air, as a piece of cork riſes in water. A maſs of water which really contains 850 pounds will load the ſcale of a balance with 849 only, and will be balanced by about $849\frac{1}{7}$ pounds of braſs. This is evinced by a very pretty experiment, repreſented in fig. 46. Fig. 46. A ſmall beam is ſuſpended within a receiver. To one end of the beam is appended a thin glaſs or copper ball, cloſe in every part. This is balanced by a ſmall piece of lead hung on the other arm. As the air is pumped out of the receiver, the ball will gradually preponderate, and will regain its equilibrium when the air is re-admitted.

164 Some naturaliſts have propoſed, and actually uſed, a large globe of light make, ſuſpended at a beam, for a barometer. If its capacity be a cubic foot, $1\frac{7}{10}$ grains will indicate the ſame change that is indicated by $\frac{1}{10}$ of an inch of an ordinary barometer. But a veſſel of this ſize will load a balance too much to leave it ſufficiently ſenſible to ſmall changes of denſity. Beſides, it is affected by heat and cold, and would require a very troubleſome equation to correct their effects.

165 It may perhaps be worth while to attend to this in buying and ſelling precious commodities; ſuch as pearls, diamonds, ſilk, and ſome drugs. As they are generally ſold by braſs or leaden weights, the buyer will have ſome advantage when the air is heavy and the barometer high. On the other hand, he will have the advantage in buying gold and mercury when the air is light. It is needleſs to confine this obſervation to precious commodities, for the advantage is the ſame in all in proportion to their levity.

166 There is a caſe in which this obſervation is of conſequence to the philoſopher: we mean the meaſuring of time by pendulums. As the accelerating force on a pendulum is not its whole weight, but the exceſs of its weight over that of the diſplaced air, it follows that a pendulum will vibrate more ſlowly in the air than *in vacuo*. A pendulum compoſed of lead, iron, and braſs, may be about 8400 times heavier than the air which it diſplaces when the barometer is at 30 inches and the thermometer at 32°, and the accelerating force will be diminiſhed about $\frac{1}{18800}$. This will cauſe a ſecond pendulum to make about five vibrations leſs in a day than it would do *in vacuo*. In order therefore to deduce the accelerative power of gravity from the length of a pendulum vibrating in the air, we muſt make an allowance of 0″.17, or $\frac{17}{100}$ of a ſecond, per day for every inch that the barometer ſtands lower than 30 inches. But we muſt alſo note the temperature of the air; becauſe when the air is warm it is leſs denſe when ſupporting by its elaſticity the ſame weight of atmoſphere, and we muſt know how much its denſity is diminiſhed by an increaſe of temperature. The correction is ſtill more complicated; for the change of denſity affects the reſiſtance of the air, and this affects the time of the vibration, and this by a law that is not yet well aſcertained. As far as we can determine from any experiments that have been made, it appears that the change ariſing from the altered reſiſtance takes off about $\frac{2}{5}$ of the change produced by the altered denſity, and that a ſecond pendulum makes but three vibrations a-day more *in vacuo* than in the open air. This is a very unexpected reſult; but it muſt be owned that the experiments have neither been numerous nor very nicely made.

The air-pump alſo allows us to ſhow the effects of the air's preſſure in a great number of amuſing and inſtructive phenomena.

When the air is abſtracted from the receiver, it is ſtrongly preſſed to the pump-plate by the incumbent atmoſphere, and it ſupports this great preſſure in conſequence of its circular form. Being equally compreſſed on all ſides, there is no place where it ſhould give way rather than another; but if it be thin, and not very round, which is ſometimes the caſe, it will be cruſhed to pieces. If we take a ſquare thin phial, and apply an exhauſting ſyringe to its mouth, it will not fail being cruſhed. 167 Experiments to ſhow the effects of the air's preſſure.

As the operation of pumping is ſomething like ſucking, many of theſe phenomena are in common diſcourſe aſcribed to ſuction, a word much abuſed; and this abuſe miſleads the mind exceedingly in its contemplation of natural phenomena. Nothing is more uſual than to ſpeak of the ſuction of a ſyringe, the ſuction and draught of a chimney, &c. The following experiment puts the true cauſe of the ſtrong adheſion of the receiver beyond a doubt.

Place a ſmall receiver or cupping-glaſs on the pump-plate without covering the central hole, as repreſented in fig. 47. and cover it with a larger receiver. Exhauſt the air from it; then admit it as ſuddenly as poſſible. Fig. 47. The outer receiver, which after the rarefaction adhered ſtrongly to the plate, is now looſe, and the cupping-glaſs will be found ſticking faſt to it. While the rarefaction was going on, the air in the ſmall receiver alſo expanded, eſcaped from it, and was abſtracted by the pump. When the external air was ſuddenly admitted, it preſſed on the ſmall receiver, and forced it down to the plate, and thus ſhut up all entry. The ſmall receiver muſt now adhere; and there can be no ſuction, for the pipe of the pump was on the outſide of the cupping-glaſs.

This experiment ſometimes does not ſucceed, becauſe the air ſometimes finds a paſſage under the brim of the cupping-glaſs. But if the cupping-glaſs be preſſed down by the hand on the greaſy leather or plate, every thing will be made ſmooth, and the glaſs will be ſo little raiſed by the expanſion of its air during the pumping, that it will inſtantly clap cloſe when the air is re-admited.

In like manner, if a thin ſquare phial be furniſhed with 168 a valve, opening from within, but ſhutting when preſſed from without, and if this phial be put under a receiver, and the air be abſtracted from the receiver, the air in the phial will expand during the rarefaction, will eſcape through the valve, and be at laſt in a very rarefied ſtate within

Air-pump. within the phial. If the air be now admitted into the receiver, it will preſs on the flat ſides of the included Fig. 48. phial and cruſh it to pieces. See fig. 48.

169 If a piece of wet ox-bladder be laid over the top of a receiver whoſe orifice is about four inches wide, and the air be exhauſted from within it, the incumbent atmoſphere will preſs down the bladder into a hollow form, and then burſt it inward with a prodigious noiſe. Fig. 49. See fig. 49. Or if a piece of thin flat glaſs be laid over the receiver, with an oiled leather between them to make the juncture air-tight, the glaſs will be broken downwards. This muſt be done with caution, becauſe the pieces of glaſs ſometimes fly about with great force.

170 If there be formed two hemiſpherical cups of braſs, with very flat thick brims, and one of them be fitted Fig. 50. with a neck and ſtopcock, as repreſented by fig. 50. the air may be abſtracted from them by ſcrewing the neck into the hole in the pump-plate. To prevent the infinuation of air, a ring of oiled leather may be put between the rims. Now unſcrew the ſphere from the pump, and fix hooks to each, and ſuſpend them from a ſtrong nail, and hang a ſcale to the loweſt. It will require a conſiderable weight to ſeparate them; namely, about 15 pounds for every ſquare inch of the great circle of the ſphere. If this be four inches diameter, it will require near 190 pounds. This pretty experiment was firſt made by Otto Guericke, and on a very great ſcale. His ſphere was of a large ſize, and when exhauſted the hemiſpheres could not be drawn aſunder by 20 horſes. It was exhibited, along with many others equally curious and magnificent, to the emperor of Germany and his court, at the breaking up of the diet of Ratiſbon in 1654.

171 If the loaded ſyringe mentioned in N° 16. be ſuſpended by its piſton from the hook in the top plate of the re- Fig. 51. ceiver, as in fig. 51. and the air be abſtracted by the pump, the ſyringe will gradually deſcend (becauſe the elaſticity of the air, which formerly balanced the preſſure of the atmoſphere, is now diminiſhed by its expanſion, and is therefore no longer able to preſs the ſyringe to the piſton), and it will at laſt drop off. If the air be admitted before this happens, the ſyringe will immediately riſe again.

172 Screw a ſhort braſs pipe into the neck of a tranſporter, N° 107. on which is ſet a tall receiver, and immerſe it into a ciſtern of water. On opening the cock the preſſure of the air on the ſurface of the water in the ciſtern will force it up through the pipe, and cauſe it to ſpout into the receiver with a ſtrong jet, becauſe there is no air within to balance by its elaſticity the preſſure of the Fig. 52. atmoſphere. See fig. 52.

173 By means of this preſſure the gage of an air-pump acts. It is in the ſame way that the gage of the air-pump performs its office. The preſſure of the atmoſphere raiſes the mercury in the gage till the weight of the mercury, together with the remaining elaſticity of the air in the receiver, are in equilibrio with the whole preſſure of the atmoſphere: therefore the height and weight of the mercury in the gage is the exceſs of the weight of the atmoſphere above the elaſticity of the included air; and the deficiency of this height from that of the mercury in the Toricellian tube is the meaſure of this remaining elaſticity.

174 If a Toricellian tube be put under a tall receiver, as Fig. 53. ſhown in fig. 53. and the air be exhauſted, the mercury in the tube will deſcend while that in the gage will riſe; and the ſum of their heights will always be the ſame, that is, equal to the height in an ordinary barometer. Air-pump. The height of the mercury in the receiver is the effect and meaſure of the remaining elaſticity of the included air, and the height in the pump-gage is the unbalanced preſſure of the atmoſphere. This is a very inſtructive experiment, perfectly ſimilar to Mr Auzout's, mentioned in N° 34. and completely eſtabliſhes and illuſtrates the whole doctrine of atmoſpheric preſſure.

175 Water riſes in pumps. We get a ſimilar illuſtration and confirmation (if ſuch a thing be now needed) of the cauſe of the riſe of water in pumps, by ſcrewing a ſyringe into the top plate of a receiver, which ſyringe has a ſhort glaſs pipe plunging into a ſmall cup of water. See fig. 54. When the piſ- Fig. 54. ton-rod is drawn up, the water riſes in the glaſs-pipe, as in any other pump, of which this is a miniature repreſentation. But if the air has been previouſly exhauſted from the receiver, there is nothing to preſs on the water in the little jar; and it will not riſe in the glaſs pipe though the piſton of the ſyringe be drawn to the top.

176 and moves in ſyphons. Analogous to the riſe of water in pumps is its riſe and motion in ſyphons. Suppoſe a pipe ABCD, fig. 55. Fig. 55. bent at right angles at B and C, and having its two ends immerſed in the ciſterns of water A and D. Let the leg CD be longer than the leg BA, and let the whole be full of water. The water is preſſed upwards at A with a force equal to the weight of the column of air E A reaching to the top of the atmoſphere; but it is preſſed downwards by the weight of the column of water B A. The water at E is preſſed downwards by the weight of the column CD, and upwards by the weight of the column of air FD reaching to the top of the atmoſphere. The two columns of air differ very little in their weight, and may without any ſenſible error be conſidered as equal. Therefore there is a ſuperiority of preſſure downwards at D, and the water will flow out there. The preſſure of the air will raiſe the water in the leg AB, and thus the ſtream will be kept up till the veſſel A is emptied as low as the orifice of the leg BA, provided the height of AB is not greater than what the preſſure of the atmoſphere can balance, that is, does not exceed 32 or 33 feet for water, 30 inches for mercury, &c.

A ſyphon then will always run from that veſſel whoſe ſurface is higheſt; the form of the pipe is indifferent, becauſe the hydroſtatical preſſures depend on the vertical height only. It muſt be filled with water by ſome other contrivance, ſuch as a funnel, or a pump applied a-top; and the funnel muſt be ſtopped up, otherwiſe the air would get in, and the water would fall in both legs.

177 If the ſyphon have equal legs, as in fig. 56. and be Fig. 56. turned up at the ends, it will remain full of water, and be ready for uſe. It need only be dipped into any veſſel of water, and the water will then flow out at the other end of the ſyphon. This is called the *Wirtemberg ſyphon*, and is repreſented in fig. 56. Syphons will afterwards be conſidered more minutely under the title of PNEUMATICAL *Engines*, at the end of this article.

178 The ſyphon fountain. What is called the *ſyphon fountain*, conſtructed on this principle, is ſhown in fig. 57. where AB is a tall recei- Fig. 57. ver, ſtanding in a wide baſon DE, which is ſupported on the pedeſtal H by the hollow pillar FG. In the centre of the receiver is a jet pipe C, and in the top a ground ſtopper A. Near the baſe of the pillar is a cock N, and in the pedeſtal is another cock O.

Fill

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Fill the bason DE with water within half an inch of the brim. Then pour in water at the top of the receiver (the cock N being shut) till it is about half full, and then put in the stopper. A little water will run out into the vessel DE. But before it runs over, open the cock N, and the water will run into the cistern H; and by the time that the pipe C appears above water, a jet will rise from it, and continue as long as water is supplied from the bason DE. The passage into the base cistern may be so tempered by the cock N that the water within the receiver shall keep at the same height, and what runs into the base may be received from the cock O into another vessel, and returned into DE, to keep up the stream.

179 Manner of its construction and operation. Fig. 58.

This pretty philosophical toy may be constructed in the following manner. BB, fig. 58. is the ferril or cap into which the receiver is cemented. From its centre descends the jet pipe C *a*, sloping outwards, to give room for the discharging pipe *b d* of larger diameter, whose lower extremity *d* fits tightly into the top of the hollow pillar FG.

Fig. 57.

The operation of the toy is easily understood. Suppose the distance from C to H (fig. 57.) three feet, which is about $\frac{1}{11}$ of the height at which the atmosphere would support a column of water. The water poured into AB would descend through FG (the hole A being shut) till the air has expanded $\frac{1}{11}$, and then it would stop. If the pipe C *a* be now opened, the pressure of the air on the surface of the water in the cistern DE will cause it to spout through C to the height of three feet nearly, and the water will continue to descend through the pipe FG. By tempering the cock N so as to allow the water to pass through it as fast as it is supplied by the jet, the amusement may be continued a long time. It will stop at last, however; because, as the jet is made into rarefied air, a little air will be extricated from the water, which will gradually accumulate in the receiver, and diminish its rarefaction, which is the moving cause of the jet. This indeed is an inconvenience felt in every employment of syphons, so much the more remarkably as their top is higher than the surface of the water in the cistern of supply.

180 Syphons are often used thus. Fig. 59.

Cases of this employment of a syphon are not unfrequent. When water collected at A (fig. 59.) is to be conducted in a pipe to C, situated in a lower part of the country, it sometimes happens, as between Lochend and Leith, that the intervening ground is higher than the fountain-head as at B. A forcing pump is erected at A, and the water forced along the pipe. Once it runs out at C, the pump may be removed, and the water will continue to run on the syphon principle, provided BD do not exceed 33 feet. But the water in that part of the conduit which is above the horizontal plane AD, is in the same state as in a receiver of rarefied air, and gives out some of the air which is chemically united with it. This gradually accumulates in the elevated part of the conduit, and at last chokes it entirely. When this happens, the forcing pump must again be worked. Although the elevation in the Leith conduit is only about eight or ten feet, it will seldom run for 12 hours. N. B. This air cannot be discharged by the usual air-cocks; for if there were an opening at B, the air would rush in, and immediately stop the motion.

181 The air-pump discovers the combination of air with water.

This combination of air with water is very distinctly seen by means of the air-pump. If a small glass containing cold water, fresh drawn from the spring, be exposed, as in fig. 6. under the receiver, and the air rarefied, small bubbles will be observed to form on the inner surface of the glass, or on the surface of any body immersed in it, which will increase in size, and then detach themselves from the glass and reach the top; as the rarefaction advances, the whole water begins to show very minute air-bubbles rising to the top; and this appearance will continue for a very long time, till it be completely disengaged. Warming the water will occasion a still farther separation of air, and a boiling heat will separate all that can be disengaged. The reason assigned for these air-bubbles first appearing on the surface of the glass, &c. is, that air is attracted by bodies, and adheres to their surface. This may be so. But it is more probably owing to the attraction of the water for the glass, which causes it to quit the air which it held in solution, in the same manner as we see it happen when it is mixed with spirits-of-wine, with vitriolic acid, &c. or when salts or sugar are dissolved in it. For if we pour out the water which has been purged of air by boiling *in vacuo*, and fill the glass with fresh water, we shall observe the same thing, although a film of the purified water was left adhering to the glass. In this case there can be no air adhering to the glass.

Elasticity, &c.

Plate CCCCXXXI. fig. 60.

Water thus purged of air by boiling (or even without boiling) *in vacuo*, will again absorb air when exposed to the atmosphere. The best demonstration of this is to fill with this water a phial, leaving about the size of a pea not filled. Immerse this in a vessel of water, with the mouth undermost, by which means the air-bubble will mount up to the bottom of the phial. After some days standing in this condition, the air-bubble will be completely absorbed, and the vessel quite filled with water. 182

The air in this state of chemical solution has lost its elasticity, for the water is not more compressible than common water. It is also found that water brought up from a great depth under ground contains much more air than water at the surface. Indeed fountain waters differ exceedingly in this respect. The water which now comes into the city of Edinburgh by pipes contains so much as to throw it into a considerable ebullition *in vacuo*. Other liquors contain much greater quantities of elastic fluids in this loosely combined state. A glass of beer treated in the same way will be almost wholly converted into froth by the escape of its fixed air, and will have lost entirely the prickling smartness which is so agreeable, and become quite vapid.

183 and illustrates the air's elasticity and expansibility.

The air-pump gives us, in the next place, a great variety of experiments illustrative of the air's elasticity and expansibility. The very operation of exhaustion, as it is called, is an instance of its great, and hitherto unlimited, expansibility. But this is not palpably exhibited to view. The following experiments show it most distinctly.

184 Experiments showing these properties.

1st, Put a flaccid bladder, of which the neck is firmly tied with a thread, under a receiver, and work the pump. The bladder will gradually swell, and will even be fully distended. Upon readmitting the air into the receiver, the bladder gradually collapses again into its former dimensions: while the bladder is flaccid, the air within it is of the same density and elasticity with the surrounding air, and its elasticity balances the pressure of the atmosphere. When part of the air of

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of the receiver is abstracted, the remainder expands so as still to fill the reciver: but by expanding, its elasticity is plainly diminished; for we see by the fact, that the elasticity of the air of the receiver no longer balances the elasticity of that in the bladder, as it no longer keeps it in its dimensions. The air in the bladder expands also: it expands till its diminished elasticity is again in equilibrio with the diminished elasticity of the air in the receiver; that is, till its density is the same. When all the wrinkles of the bladder have disappeared, its air can expand no more, although we continue to diminish the elasticity of the air of the receiver by further rarefaction. The bladder now tends to burst; and if it be pierced by a point or knife fastened to the slip-wire, the air will rush out, and the mercury descend rapidly in the gage.

185 If a phial or tube be partly filled with water, and immersed in a vessel of water with the mouth downwards, the air will occupy the upper part of the phial. If this apparatus be put under a receiver, and the air be abstracted, the air in the phial will gradually expand, allowing the water to run out by its weight till the surface of the water be on a level within and without. When this is the case, we must grant that the density and elasticity of the air in the phial is the same with that in the receiver. When we work the pump again, we shall observe the air in the phial expand still more, and come out of the water in bubbles. Continuing the operation, we shall see the air continually escaping from the phial: when this is over, it shows that the pump can rarefy no more. If we now admit the air into the receiver, we shall see the water rise into the phial, and at last almost completely fill it, leaving only a very small bubble of air at top. This bubble had expanded so as to fill the whole phial. See this represented in fig. 61.

Fig. 61. 186 Every one must have observed a cavity at the big end of an egg between the shell and the white. The white and yolk are contained in a thin membrane or bladder which adheres loosely to the shell, but is detached from it at that part; and this cavity increases by keeping the egg in a dry place. One may form a judgment of its size, and therefore of the freshness of the egg, by touching it with the tongue; for the shell, where it is not in contact with the contents, will presently feel warm, being quickly heated by the tongue, while the rest of the egg will feel cold.

If a hole be made in the opposite end of the egg, and it be set on a little tripod, and put under a receiver, the expansion of the air in the cavity of the egg will force the contents through the hole till the egg be quite emptied: or, if nearly one half of the egg be taken away at the other end, and the white and yolk taken out, and the shell be put under a receiver, and the air abstracted, the air in the cavity of the egg will expand, gradually detaching the membrane from the shell, till it causes it to swell out, and gives the whole the appearance of an entire egg. In like manner shrivelled apples and other fruits will swell in vacuo by the expansion of the air confined in their cavities.

187 If a piece of wood, a twig with green leaves, charcoal, plaster of Paris, &c. be kept under water in vacuo, a prodigious quantity of air will be extracted; and if we readmit the air into the receiver, it will force the water into the pores of the body. In this case the body will not swim in water as it did before, showing that the vegetable fibres are specifically heavier than water. It is found, however, that the air contained in the pith and bark, such as cork, is not all extricated in this way; and that much of it is contained in vesicles which have no outlet: being secreted into them in the process of vegetation, as it is secreted into the air bladder of fishes, where it is generally found in a pretty compressed state, considerably denser than the surrounding air. The air-bladder of a fish is surrounded by circular and longitudinal muscles, by which the fish can compress the air still further; and, by ceasing to act with them, allow it to swell out again. It is in this manner that the fish can suit its specific gravity to its situation in the water, so as to have no tendency either to rise or sink: but if the fish be put into the receiver of an air-pump, the rarefaction of the air obliges the fish to act more strongly with these contracting muscles, in order to adjust its specific gravity; and if too much air has been abstracted from the receiver, the fish is no longer able to keep its air-bladder in the proper degree of compression. It becomes therefore too buoyant, and comes to the top of the water, and is obliged to struggle with its tail and fins in order to get down; frequently in vain. The air-bladder sometimes bursts, and the fish goes to the bottom, and can no longer keep above without the continual action of its tail and fins. When fishes die, they commonly float at top, their contractive action being now at an end. All this may be illustrated (but very imperfectly) by a small half blown bladder, to which is appended a bit of lead, just so heavy as to make it sink in water: when this is put under a receiver, and the air abstracted, the bubble will rise to the top; and, by nicely adjusting the rarefaction, it may be kept at any height. See fig. 62. Fig. 62. 188

Compressibility, &c.

The playthings called *Cartesian devils* are similar to this: they are hollow glass figures, having a small aperture in the lower part of the figures, as at the point of the foot; their weight is adjusted so that they swim upright in water. When put into a tall jar filled to the top, and having a piece of leather tied over it, they will sink in the water, by pressing on the leather with the ball of the hand: this, by compressing the water, forces some of it to enter into the figure and makes it heavier than the water; for which reason it sinks, but rises again on removing the pressure of the hand. See figs. 63. and 64. Figs 63. and 64.

If a half blown ox-bladder be put into a box, and great weights laid on it, and the whole be put under a receiver, and the air abstracted; the air will, by expanding, lift up the weights, though above an hundred pounds. See fig. 65. Fig. 65. 189

By such experiments the great expansibility of the air is abundantly illustrated, as its compressibility was formerly by means of the condensing syringe. We now see that the two sets of experiments form an uninterrupted chain; and that there is no particular state of the air's density where the compressibility and expansibility are remarkably dissimilar. Air in its ordinary state expands; because its ordinary state is a state of compression by the weight of the atmosphere: and if there were a pit about 33 miles deep, the air at the bottom would probably be as dense as water; and if it were 50 miles deep, it would be as dense as gold, if it did not become a liquid before this depth: nay, if a bottle with its mouth undermost were immersed six miles under water, it would probably be as dense as water; we say probably,

Compressibility and expansibility are in no state of the air very dissimilar.

probably, for this depends on the nature of its compreſſibility; that is, on the relation which ſubſiſts between the compreſſion and the force which produces it.

190 Relation between compreſſion and the force producing it.

This is the circumſtance of its conſtitution, which we now proceed to examine; and it is evidently a very important circumſtance. We have long ago obſerved, that the great compreſſibility and permanent fluidity of air, obſerved in a vaſt variety of phenomena, is totally inexplicable, on the ſuppoſition that the particles of air are like ſo many balls of ſponge or ſo many foot-balls. Give to thoſe what compreſſibility you pleaſe, common air could no more be fluid than a maſs of clay; it could no more be fluid than a maſs of ſuch balls preſſed into a box. It can be demonſtrated (and indeed hardly needs a demonſtration), that before a parcel of ſuch balls, juſt touching each other, can be ſqueezed into half their preſent dimenſions, their globular ſhape will be entirely gone, and each will have become a perfect cube, touching ſix other cubes with its whole ſurface; and theſe cubes will be ſtrongly compreſſed together, ſo that motion could never be performed through among them by any ſolid body without a very great force. Whereas we know that in this ſtate air is juſt as permeable to every body as the common air that we breathe. There is no way in which we can repreſent this fluidity to our imagination, but by conceiving air to conſiſt of particles, not only diſcrete, but diſtant from each other, and actuated by repulſive forces, or ſomething analogous to them. It is an idle ſubterfuge, to which ſome naturaliſts have recourſe, ſaying, that they are kept aſunder by an intervening ether, or elaſtic fluid of any other name. This is only removing the difficulty a ſtep farther off: for the elaſticity of this fluid requires the ſame explanation; and therefore it is neceſſary, in obedience to the rules of juſt reaſoning, to begin the inquiry here; that is, to determine from the phenomena what is the analogy between the diſtances of the particles and the repulſive forces exerted at theſe diſtances, proceeding in the ſame way as in the examination of planetary gravitation. We ſhall learn the analogy by attending to the analogy between the compreſſing force and the denſity.

191 Denſity explained as applied to air.

For the denſity depends on the diſtance between the particles; the nearer they are to each other, the denſer is the air. Suppoſe a ſquare pipe one inch wide and eight inches long, ſhut at one end, and filled with common air; then ſuppoſe a plug ſo nicely fitted to this pipe that no air can paſs by its ſides; ſuppoſe this piſton thruſt down to within an inch of the bottom: it is evident that the air which formerly filled the whole pipe now occupies the ſpace of one cubic inch, which contains the ſame number of particles as were formerly diffuſed over eight cubic inches.

The condenſation would have been the ſame if the air which fills a cube whoſe ſide is two inches had been ſqueezed into a cube of one inch, for the cube of two inches alſo contains eight inches. Now, in this caſe it is evident that the diſtance between the particles would be reduced to its half in every direction. In like manner, if a cube whoſe ſide is three inches, and which therefore contains 27 inches, be ſqueezed into one inch, the diſtance of the particles will be one-third of what it was: in general the diſtance of the particles will be as the cube-root of the ſpace into which they are compreſſed. If the ſpace be $\frac{1}{8}$, $\frac{1}{27}$, $\frac{1}{64}$, $\frac{1}{125}$, &c. of its former dimenſions, the diſtance of the particles will be $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, &c. Now the term *denſity*, in its ſtrict ſenſe, expreſſes the vicinity of the particles; *denſi arbores* are trees growing near each other. The meaſure of this vicinity therefore is the true meaſure of the denſity; and when 27 inches of air are compreſſed into one, we ſhould ſay that it is three times as denſe; but we ſay, that it is 27 times denſer.

192 Farther explanation.

Denſity is therefore uſed in a ſenſe different from its ſtricteſt acceptation: it expreſſes the comparative number of equidiſtant particles contained in the ſame bulk. This is alſo abundantly preciſe, when we compare bodies of the ſame kind, differing in denſity only; but we alſo ſay, that gold is 19 times denſer than water, becauſe the ſame bulk of it is 19 times heavier. This aſſertion proceeds on the aſſumption, or the fact, that every ultimate atom of terreſtrial matter is equally heavy: a particle of gold may contain more or fewer atoms of matter than a particle of water. In ſuch a caſe, therefore, the term denſity has little or no reference to the vicinity of the particles; and is only a term of compariſon of other qualities or accidents.

But when we ſpeak of the reſpective denſities of the ſame ſubſtance in its different ſtates of compreſſion, the word *denſity* is ſtrictly connected with vicinity of particles, and we may ſafely take either of the meaſures. We ſhall abide by the common acceptation, and call that air eight times as denſe which has eight times as many particles in the ſame bulk, although the particles are only twice as near to each other.

193 The analogy between the compreſſing force and the diſtance of the particles, &c.

Thus then we ſee, that by obſerving the analogy between the compreſſing force and the denſity, we ſhall diſcover the analogy between the compreſſing force and the diſtance of the particles. Now the force which is neceſſary for compreſſing two particles of air to a certain vicinity is a proper meaſure of the elaſticity of the particles correſponding to that vicinity or diſtance; for it balances it, and forces which balance muſt be eſteemed equal. Elaſticity is a diſtinctive name for that corpuſcular force which keeps the particles at that diſtance: therefore obſervations made on the analogy between the compreſſing force and the denſity of air will give us the law of its corpuſcular force, in the ſame way that obſervations on the ſimultaneous deflections of the planets towards the ſun give us the law of celeſtial gravitation.

But the ſenſible compreſſing forces which we are able to apply is at once exerted on unknown thouſands of particles, while it is the law of action of a ſingle particle that we want to diſcover. We muſt therefore know the *proportion* of the numbers of particles on which the compreſſing force is exerted. It is eaſy to ſee, that ſince the diſtance of the particles is as the cube root of the denſity inverſely, the number of particles in phyſical contact with the compreſſing ſurface muſt be as the ſquare of this root. Thus when a cube of 8 inches is compreſſed into one inch, and the particles are twice as near each other as they were before, there muſt be four times the number of particles in contact with each of the ſides of this cubical inch; or, when we have puſhed down the ſquare piſton of the pipe ſpoken of above to within an inch of the bottom, there will be four times the number of particles *immediately* contiguous to the piſton, and reſiſting the compreſſion; and in order to obtain the force really exerted on one particle, and the elaſticity of that particle, we muſt divide the whole compreſſing 194

preſſing

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preffing force by 4. In like manner, if we have compreffed air into $\frac{1}{27}$ of its former bulk, and brought the particles to $\frac{1}{3}$ of their former diftance, we muft divide the compreffing force by 9. In general if d exprefs the denfity, $\frac{1}{\sqrt[3]{d}}$ will exprefs the diftance x of the particles; $\sqrt[3]{d}$, or $d^{\frac{1}{3}}$, will exprefs the vicinity or real denfity; and $d^{\frac{2}{3}}$ will exprefs the number of particles acting on the compreffing furface: and if f exprefs the accumulated external compreffing force, $\frac{f}{d^{\frac{2}{3}}}$ will exprefs the force acting on one particle; and therefore the elafticity of that particle correfponding to the diftance x.

195 Experiments eftablifhing the law of compreffion.

We may now proceed to confider the experiments by which the law of compreffion is to be eftablifhed.

The firft experiments to this purpofe were thofe made by Mr Boyle, publifhed in 1661 in his *Defenfio Doctrinæ de Aeris Elatere contra Linum*, and exhibited before the Royal Society the year before. Mariotte made experiments of the fame kind, which were publifhed in 1676 in his *Effai fur la Nature de l'Air* and *Traité des Mouvemens des Eaux*. The moft copious experiments are thofe by Sulzer (*Mem. Berlin.* ix.), thofe by Fontana (*Opufc. Phyfico-Math.*), and thofe by Sir George Shuckburgh and Gen. Roy.

196 Compreffibility of air not rarer than the atmofphere at the earth's furface. Fig. 66.

In order to examine the compreffibility of air that is not rarer than the atmofphere at the furface of the earth, we employ a bent tube or fyphon ABCD (fig. 66.), hermetically fealed at A and open at D. The fhort leg AB muft be very accurately divided in the proportion of its folid contents, and fitted with a fcale whofe units denote equal increments, not of length, but of capacity. There are various ways of doing this; but it requires the moft fcrupulous attention, and without this the experiments are of no value. In particular, the arched form at A muft be noticed. A fmall quantity of mercury muft then be poured into the tube, and paffed backwards and forwards till it ftands (the tube being held in a vertical pofition) on a level at B and C. Then we are certain that the included air is of the fame denfity with that of the contiguous atmofphere. Mercury is now poured into the leg DC, which will fill it, fuppofe to G, and will comprefs the air into a fmaller fpace AE. Draw the horizontal line EF: the new bulk of the compreffed air is evidently AE, meafured by the adjacent fcale, and the addition made to the compreffing force of the atmofphere is the weight of the column GF. Produce GF downwards to H, till FH is equal to the height fhown by a Toricellian tube filled with the *fame mercury*; then the whole compreffing force is HG. This is evidently the meafure of the elafticity of the compreffed air in AE, for it balances it. Now pour in more mercury, and let it rife to g, compreffing the air into Ae. Draw the horizontal line ef, and make fh equal to FH; then Ae will be the new bulk of the compreffed air, $\frac{AB}{Ae}$ will be its new denfity, and hg will be the meafure of the new elafticity. This operation may be extended as far as we pleafe, by lengthening the tube CD, and taking care that it be ftrong enough to refift the great preffure. Great care muft be taken to keep the whole in a conftant temperature, becaufe the elafticity of air is greatly affected by heat, and the change by any increafe of temperature is different according to its denfity or compreffion.

197 Experiments of Boyle, &c. neither nicely made nor extended to very great compreffions.

The experiments of Boyle, Mariotte, Amontons, and others, were not extended to very great compreffions, the denfity of the air not having been quadrupled in any of them; nor do they feem to have been made with very great nicety. It may be collected from them in general, that the elafticity of the air is very nearly proportioned to its denfity; and accordingly this law was almoft immediately acquiefced in, and was called the *Boylean law*: it is accordingly affumed by almoft all writers on the fubject as exact. Of late years, however, there occurred queftions in which it was of importance that this point fhould be more fcrupuloufly fettled, and the former experiments were repeated and extended. Sulzer and Fontana have carried them farther than any other. Sulzer compreffed air into one-eighth of its former dimenfions.

198 Varieties, &c. in thefe experiments.

Confiderable varieties and irregularities are to be obferved in thefe experiments. It is extremely difficult to preferve the temperature of the apparatus, particularly of the leg AB, which is moft handled. A great quantity of mercury muft be employed; and it does not appear that philofophers have been careful to have it precifely fimilar to that in the barometer, which gives us the unit of compreffing force and of elafticity. The mercury in the barometer fhould be pure and boiled. If the mercury in the fyphon is adulterated with bifmuth and tin, which it commonly is to a confiderable degree, the compreffing force, and confequently the elafticity, will appear greater than the truth. If the barometer has not been nicely fitted, it will be lower than it fhould be, and the compreffing force will apappear too great, becaufe the unit is too fmall; and this error will be moft remarkable in the fmaller compreffions.

199 Heterogeneous nature of the air the greateft fource of error.

The greateft fource of error and irregularity in the experiments is the very heterogeneous nature of the air itfelf. Air is a folvent of all fluids, all vapours, and perhaps of many folid bodies. It is highly improbable that the different compounds fhall have the fame elafticity, or even the fame law of elafticity: and it is well known, that air, loaded with water or other volatile bodies, is much more expanfible by heat than pure air; nay, it would appear from many experiments, that certain determinate changes both of denfity and of temperature, caufe air to let go the vapours which it holds in folution. Cold caufes it to precipitate water, as appears in dew; fo does rarefaction, as is feen in the receiver of an air-pump.

200 The air's elafticity does not increafe fo faft as its denfity.

In general, it appears that the elafticity of air does not increafe quite fo faft as its denfity. This will be beft feen by the following tables, calculated from the experiments of Mr Sulzer. The column E in each fet of experiments expreffes the length of the column GH, the unit being FH, while the column D expreffes $\frac{AB}{AE}$.

1ft

Experiments on Air.

1st Set.		2d Set.		3d Set.	
D	E	D	E	D	E
1.000	1.000	1.000	1.000	1.000	1.000
1.100	1.093	1.236	1.224	1.091	1.076
1.222	1.211	1.294	1.288	1.200	1.183
1.375	1.284	1.375	1.332	1.333	1.303
1.571	1.559	1.466	1.417	1.500	1.472
1.692	1.669	1.571	1.515	1.714	1.659
1.833	1.796	1.692	1.647		
2.000	1.958	2.000	1.964	2.000	1.900
2.288	2.130				
2.444	2.375	2.444	2.392	2.400	2.241
3.143	2.936	3.143	3.078	3.000	2.793
3.666	3.391	3.666	3.575		
4.000	3.706			4.000	3.631
4.444	4.035	4.444	4.320		
4.888	4.438				
5.500	4.922	5.500	5.096		
5.882	5.522			6.000	5.297
		7.333	6.694		
				8.000	6.835

201 There appears in thefe experiments fufficient grounds for calling in queftion the Boylean law; and the writer of this article thought it incumbent on him to repeat them with fome precautions, which probably had not been attended to by Mr Sulzer. He was particularly anxious to have the air as free as poffible from moifture. For this purpofe, having detached the fhort leg of the fyphon, which was 34 inches long, he boiled mercury in it, and filled it with mercury boiling hot. He took a tinplate veffel of fufficient capacity, and put into it a quantity of powdered quicklime juft taken from the kiln; and having clofed the mouth, he agitated the lime through the air in the veffel, and allowed it to remain there all night. He then emptied the mercury out of the fyphon into this veffel, keeping the open end far within it. By this means the fhort leg of the fyphon was filled with very dry air. The other part was now joined, and boiled mercury put into the bend of the fyphon; and the experiment was then profecuted with mercury which had been recently boiled, and was the fame with which the barometer had been carefully filled.

202 The refults of the experiments are expreffed in the following table.

Dry Air.		Moift Air.		Damp Air.	
D	E	D	E	D	E
1.000	1.000	1.000	1.000	1.000	1.000
2.000	1.957	2.000	1.920	2.000	1.909
3.000	2.848	3.000	2.839	3.000	2.845
4.000	3.737	4.000	3.726	4.000	3.718
5.500	4.930	5.500	5.000	5.500	5.104
6.000	5.342	6.000	5.452	6.000	5.463
7.620	6.490	7.620	6.775	7.620	6.812

Here it appears again in the cleareft manner that the elafticities do not increafe as faft as the denfities, and the differences are even greater than in Mr Sulzer's experiments.

Elafticity.

The fecond table contains the refults of experiments made on very damp air in a warm fummer's morning. In thefe it appears that the elafticities are almoft precifely proportional to the denfities + a fmall conftant quantity, nearly 0.11, deviating from this rule chiefly between the denfities 1 and 1.5, within which limits we have very nearly $D = E^{1.027}$. As this air is nearer to the conftitution of atmofpheric air than the former, this rule may be fafely followed in cafes where atmofpheric air is concerned, as in meafuring the depths of pits by the barometer. 203

The third table fhows the compreffion and elafticity of air ftrongly impregnated with the vapours of camphire. Here the Boylean law appears pretty exact, or rather the elafticity feems to increafe a little fafter than the denfity. 204

Dr Hooke examined the compreffion of air by immerfing a bottle to great depths in the fea, and weighing the water which got into it without any efcape of air. But this method was liable to great uncertainty, on account of the unknown temperature of the fea at great depths. 205

206

Hitherto we have confidered only fuch air as is not rarer than what we breathe; we muft take a very different method for examining the elafticity of rarefied air. Mode of examining the elafticity of rarefied air.

Let $g\,h$ (fig. 67.) be a long tube, formed a-top into a cup, and of fufficient diameter to receive another fmaller tube $a\,f$, open at firft at both ends. Let the outer tube and cup be filled with mercury, which will rife in the inner tube to the fame level. Let $a\,f$ now be ftopped at a. It contains air of the fame denfity and elafticity with the adjoining atmofphere. Note exactly the fpace $a\,b$ which it occupies. Draw it up into the pofition of fig. 68. and let the mercury ftand in it at the height $d\,e$, while $c\,e$ is the height of the mercury in the barometer. It is evident that the column $d\,e$ is in equilibrio between the preffure of the atmofphere and the elafticity of the air included in the fpace $a\,d$. And fince the weight of $c\,e$ would be in equilibrio with the whole preffure of the atmofphere, the weight of $c\,d$ is equivalent to the elafticity of the included air. While therefore $c\,e$ is the meafure of the elafticity of the furrounding atmofphere, $c\,d$ will be the meafure of the elafticity of the included air; and fince the air originally occupied the fpace $a\,b$, and has now expanded into $a\,d$, we have $\frac{a\,b}{a\,d}$ for the meafure of its denfity. N. B. $c\,e$ and $c\,d$ are meafured by the *perpendicular heights* of the columns, but $a\,b$ and $a\,d$ muft be meafured by their *folid capacities*. Fig. 67. Fig. 68.

By raifing the inner tube ftill higher, the mercury will alfo rife higher, and the included air will expand ftill farther, and we obtain another $c\,d$, and another $\frac{a\,b}{a\,d}$; and in this manner the relation between the denfity and elafticity of rarefied air may be difcovered. 207

208

This examination may be managed more eafily by means of the air-pump. Suppofe a tube $a\,e$ (fig. 69.) containing a fmall quantity of air $a\,b$, fet up in a ciftern of mercury, which is fupported in the tube at the height $e\,b$, An eafier method by means of the air-pump. Fig. 69.

Experiments on Air.

e b, and let *e c* be the height of the mercury in the barometer. Let this apparatus be set under a tubulated receiver on the pump-plate, and let *g n* be the pump-gage, and *m n* be equal to *c e*.

Then, as has been already shown, *c b* is the measure of the elasticity of the air in *a b*, corresponding to the bulk *a b*. Now let some air be abstracted from the receiver. The elasticity of the remainder will be diminished by its expansion; and therefore the mercury in the tube *a e* will descend to some point *d*. For the same reason, the mercury in the gage will rise to some point *o*, and *m o* will express the elasticity of the air in the receiver. This would support the mercury in the tube *a e* at the height *e r*, if the space *a r* were entirely void of air. Therefore *r d* is the effect and measure of the elasticity of the included air when it has expanded to the bulk *a d*; and thus its elasticity, under a variety of other bulks, may be compared with its elasticity when of the bulk *a b*. When the air has been so far abstracted from the receiver that the mercury in *a e* descends to *e*, then *m o* will be the precise measure of its elasticity.

In all these cases it is necessary to compare its bulk *a b* with its natural bulk, in which its elasticity balances the pressure of the atmosphere. This may be done by laying the tube *a e* horizontally, and then the air will collapse into its ordinary bulk.

209 Another easy method. Fig. 70.

Another easy method may be taken for this examination. Let an apparatus *a b c d e f* (fig. 70.) be made, consisting of a horizontal tube *a e* of even bore, a ball *d g e* of a large diameter, and a swan-neck tube *h f*. Let the ball and part of the tube *g e b* be filled with mercury, so that the tube may be in the same horizontal plane with the surface *d e* of the mercury in the ball. Then seal up the end *a*, and connect *f* with an air-pump. When the air is abstracted from the surface *d e*, the air in *a b* will expand into a larger bulk *a c*, and the mercury in the pump-gage will rise to some distance below the barometric height. It is evident that this distance, without any farther calculation, will be the measure of the elasticity of the air pressing on the surface *d e*, and therefore of the air in *a e*.

210 The most exact mode of examining this elasticity.

The most exact of all methods is to suspend in the receiver of an air-pump a glass vessel, having a very narrow mouth, over a cistern of mercury, and then abstract the air till the gage rises to some determined height. The difference *e* between this height and the barometric height determines the elasticity of the air in the suspended vessel. Now lower down that vessel by the slip-wire till its mouth is immersed into the mercury, and admit the air into the receiver; it will press the mercury into the little vessel. Lower it still farther down, till the mercury within it is level with that without; then stop its mouth, take it out and weigh the mercury, and let its weight be *w*. Subtract this weight from the weight *v* of the mercury, which would completely fill the whole vessel; then the natural bulk of the air will be $v-w$, while its bulk, when of the elasticity *e* in the rarefied receiver, was the bulk or capacity *w* of the vessel. Its density therefore, corresponding to this elasticity *e*, was $\frac{v-w}{w}$.

And thus may the relation between the density and elasticity in all cases be obtained.

A great variety of experiments to this purpose have been made, with different degrees of attention, according to the interest which the philosophers had in the result. Those made by M. de Luc, General Roy, Mr Trembley, and Sir George Shuckburgh, are by far the most accurate; but they are all confined to very moderate rarefactions. The general result has been, that the elasticity of rarefied air is very nearly proportional to its density. We cannot say with confidence that any regular deviation from this law has been observed, there being as many observations on one side as on the other; but we think that it is not unworthy the attention of philosophers to determine it with precision in the cases of extreme rarefaction, where the irregularities are most remarkable. The great source of error is a certain adhesive sluggishness of the mercury when the impelling forces are very small; and other fluids can hardly be used, because they either smear the inside of the tube and diminish its capacity, or they are converted into vapour, which alters the law of elasticity.

Boylean Law.

211 Various experiments have been made to this purpose.

212 The Boylean law may in general be assumed.

Let us, upon the whole, assume the Boylean law, *viz.* that the elasticity of the air is proportional to its density. The law deviates not in any sensible degree from the truth in those cases which are of the greatest practical importance, that is, when the density does not much exceed or fall short of that of ordinary air.

213 Investigation of the action of the particles on each other.

Let us now see what information this gives us with respect to the action of the particles on each other.

The investigation is extremely easy. We have seen that a force eight times greater than the pressure of the atmosphere will compress common air into the eighth part of its common bulk, and give it eight times its common density: and in this case we know, that the particles are at half their former distance, and that the number which are now acting on the surface of the piston employed to compress them is quadruple of the number which act on it when it is of the common density. Therefore, when this eightfold compressing force is distributed over a fourfold number of particles, the portion of it which acts on each is double. In like manner, when a compressing force 27 is employed, the air is compressed into $\frac{1}{27}$ of its former bulk, the particles are at $\frac{1}{3}$ of their former distance, and the force is distributed among 9 times the number of particles; the force on each is therefore 3. In short, let $\frac{1}{x}$ be the distance of the particles, the number of them in any given vessel, and therefore the density will be as x^3, and the number pressing by their elasticity on its whole internal surface will be as x^2. Experiment shows, that the compressing force is as x^3, which being distributed over the number as x^2, will give the force on each as x. Now this force is in immediate equilibrium with the elasticity of the particle immediately contiguous to the compressing surface. This elasticity is therefore as x: and it follows from the nature of perfect fluidity, that the particle adjoining to the compressing surface presses with an equal force on its adjoining particles on every side. Hence we must conclude, that the corpuscular repulsions exerted by the adjoining particles are inversely as their distances from each other, or that the adjoining particles tend to recede from each other with forces inversely proportional to their distances.

214 Sir Isaac Newton was the first who reasoned properly on this subject.

Sir Isaac Newton was the first who reasoned in this manner from the phenomena. Indeed he was the first who had the patience to reflect on the phenomena with any precision. His discoveries in gravitation naturally gave

Boylean Law. gave his thoughts this turn, and he very early hinted his suspicions that all the characteristic phenomena of tangible matter were produced by forces which were exerted by the particles at small and insensible distances: And he considers the phenomena of air as affording an excellent example of this investigation, and deduces from them the law which we have now demonstrated; and says, that air consists of particles which avoid the adjoining particles with forces inversely proportional to their distances from each other. From this he deduces (in the 2d book of his Principles) several beautiful propositions, determining the mechanical constitution of the atmosphere.

215 Limits the action to adjoining particles. But it must be noticed that he limits this action to the *adjoining* particles: and this is a remark of immense consequence, though not attended to by the numerous experimenters who adopt the law.

It is plain that the particles are supposed to act at a distance, and that this distance is variable, and that the forces diminish as the distances increase. A very ordinary air-pump will rarefy the air 125 times. The distance of the particles is now 5 times greater than before; and yet they still repel each other: for air of this density will still support the mercury in a syphon-gage at the height of 0.24, or $\frac{24}{100}$ of an inch; and a better pump will allow this air to expand twice as much, and still leave it elastic. Thus we see that whatever is the distance of the particles of common air, they can act five times farther off. The question comes now to be, Whether, in the state of common air, they really do act five times farther than the distance of the adjoining particles? While the particle *a* acts on the particle *b* with the force 5, does it also act on the particle *c* with the force 2.5, on the particle *d* with the force 1.667, on the particle *e* with the force 1.25, on the particle *f* with the force 1, on the particle *g* with the force 0.8333, &c.?

216 Sir Isaac Newton shows in the plainest manner, that this is by no means the case; for if this were the case, he makes it appear that the sensible phenomena of condensation would be totally different from what we observe. The force necessary for a quadruple condensation would be eight times greater, and for a nonuple condensation the force must be 27 times greater. Two spheres filled with condensed air must repel each other, and two spheres containing air that is rarer than the surrounding air must attract each other, &c. &c. All this will appear very clearly, by applying to air the reasoning which Sir Isaac Newton has employed in deducing the sensible law of mutual tendency of two spheres, which consist of particles attracting each other with forces proportional to the square of the distance inversely.

217 If we could suppose that the particles of air repelled each other with invariable forces at all distances within some small and insensible limit, this would produce a compressibility and elasticity similar to what we observe. For if we consider a row of particles, within this limit, as compressed by an external force applied to the two extremities, the action of the whole row on the extreme points would be proportional to the number of particles, that is, to their distance inversely and to their density: and a number of such parcels, ranged in a straight line, would constitute a row of any sensible magnitude having the same law of compression. But this law of corpuscular force is unlike every thing we observe in nature, and to the last degree improbable. Height of the Atmosphere.

We must therefore continue the limitation of this mutual repulsion of the particles of air, and be contented for the present with having established it as an experimental fact, that the *adjoining* particles of air are kept asunder by forces inversely proportional to their distances: or perhaps it is better to abide by the sensible law, that *the density of air is proportional to the compressing force*. This law is abundantly sufficient for explaining all the subordinate phenomena, and for giving us a complete knowledge of the mechanical constitution of our atmosphere. 218

And in the first place, this view of the compressibility of the air must give us a very different notion of the height of the atmosphere from what we deduced on a former occasion from our experiments. It is found, that when the air is of the temperature 32° of Fahrenheit's thermometer, and the mercury in the barometer stands at 30 inches, it will descend one-tenth of an inch if we take it to a place 87 feet higher. Therefore, if the air were equally dense and heavy throughout, the height of the atmosphere would be $30 \times 10 \times 87$ feet, or 5 miles and 100 yards. But the loose reasoning adduced on that occasion was enough to show us that it must be much higher; because every stratum as we ascend must be successively rarer as it is less compressed by incumbent weight. Not knowing to what degree air expanded when the compression was diminished, we could not tell the successive diminutions of density and consequent augmentation of bulk and height; we could only say, that several atmospheric appearances indicated a much greater height. Clouds have been seen much higher; but the phenomenon of the twilight is the most convincing proof of this. There is no doubt that the visibility of the sky or air is owing to its want of perfect transparency, each particle (whether of matter purely aerial or heterogeneous) reflecting a little light. 219 The height of the air investigated from considering its compressibility, &c.

Let *b* (fig. 71.) be the last particle of illuminated air which can be seen in the horizon by a spectator at A. This must be illuminated by a ray SD *b*, touching the earth's surface at some point D. Now it is a known fact, that the degree of illumination called *twilight* is perceived when the sun is 18° below the horizon of the spectator, that is, when the angle E *b* S or ACD is 18 degrees; therefore *b* C is the secant of 9 degrees (it is less, viz. about $8\frac{1}{2}$ degrees, on account of refraction). We know the earth's radius to be about 3970 miles: hence we conclude *b* B to be about 45 miles; nay, a very sensible illumination is perceptible much farther from the sun's place than this, perhaps twice as far, and the air is sufficiently dense for reflecting a sensible light at the height of nearly 200 miles. 220 Fig. 71.

We have now seen that air is prodigiously expansible. None of our experiments have distinctly shown us any limit. But it does not follow that it is expansible without end; nor is this at all likely. It is much more probable that there is a certain distance of the parts in which they no longer repel each other; and this would be the distance at which they would arrange themselves if they were not heavy. But at the very summit of the atmosphere they will be a very small matter nearer to each other, on account of their gravitation to the earth. 221 Experiment fixes no limit to the air's expansibility.

Till

Height of the Atmoſphere.

Till we know preciſely the law of this mutual repulſion, we cannot ſay what is the height of the atmoſphere.

222 Farther obſervations on, and inveſtigation of, the height of the atmoſpere.

But if the air be an elaſtic fluid whoſe denſity is always proportionable to the compreſſing force, we can tell what is its denſity at any height above the ſurface of the earth: and we can compare the denſity ſo calculated with the denſity diſcovered by obſervation: for this laſt is meaſured by the height at which it ſupports mercury in the barometer. This is the direct meaſure of the preſſure of the external air; and as we know the law of gravitation, we can tell what would be the preſſure of air having the calculated denſity in all its parts.

223 Let us therefore ſuppoſe a priſmatic or cylindric column of air reaching to the top of the atmoſphere. Let this be divided into an indefinite number of ſtrata of very ſmall and equal depths or thickneſs; and let us, for greater ſimplicity, ſuppoſe at firſt that a particle of air is of the ſame weight at all diſtances from the centre of the earth.

224 The abſolute weight of any one of theſe ſtrata will on theſe conditions be proportional to the number of particles or the gravity of air contained in it; and ſince the depth of each ſtratum is the ſame, this quantity of air will evidently be as the denſity of the ſtratum: but the denſity of any ſtratum is as the compreſſing force; that is, as the preſſure of the ſtrata above it; that is, as their weight; that is, as their quantity of matter—therefore the quantity of air in each ſtratum is proportional to the quantity of air above it; but the quantity in each ſtratum is the difference between the column incumbent on its bottom and on its top: theſe differences are therefore proportional to the quantities of which they are the differences. But when there is a ſeries of quantities which are proportional to their own differences, both the quantities and their differences are in continual or geometrical progreſſion: for let a, b, c, be three ſuch quantities that

$b : c = a-b : b-c$, then by alter.

$b : a-b = c : b-c$ and by compoſ.

$b : a = c : b$

and $a : b = b : c$

therefore the denſities of theſe ſtrata decreaſe in a geometrical progreſſion; that is, when the elevations above the centre or ſurface of the earth increaſe, or their depths under the top of the atmoſphere decreaſe, in an arithmetical progreſſion, the denſities decreaſe in a geometrical progreſſion.

225 Fig. 72. Let ARQ (fig. 72.) repreſent the ſection of the earth by a plane through its centre O, and let m OAM be a vertical line, and AE perpendicular to OA will be a horizontal line through A, a point on the earth's ſurface. Let AE be taken to repreſent the denſity of the air at A; and let DH, parallel to AE, be taken to AE as the denſity at D is to the denſity at A: it is evident, that if a logiſtic or logarithmic curve EHN be drawn, having AN for its axis, and paſſing through the points E and H, the denſity of the air at any other point C, in this vertical line, will be repreſented by CG, the ordinate to the curve in that point: for it is the property of this curve, that if portions AB, AC, AD, of its axis be taken in arithmetical progreſſion, the ordinates, AE, BF, CG, DH, will be in geometrical progreſſion.

226 It is another fundamental property of this curve, that if EK or HS touch the curve in E or H, the ſubtangent AK or DS is a conſtant quantity.

227 And a third fundamental property is, that the infinitely extended area MAEN is equal to the rectangle KAEL of the ordinate and ſubtangent; and, in like manner, the area MDHN is equal to SD × DH, or to KA × DH; conſequently the area lying beyond any ordinate is proportional to that ordinate.

228 Theſe geometrical properties of this curve are all analogous to the chief circumſtances in the conſtitution of the atmoſphere, on the ſuppoſition of equal gravity. The area MCGN repreſents the whole quantity of aerial matter which is above C: for CG is the denſity at C, and CD is the thickneſs of the ſtratum between C and D; and therefore CGHD will be as the quantity of matter or air in it; and in like manner of all the others, and of their ſums, or the whole area MCGN: and as each ordinate is proportional to the area above it, ſo each denſity, and the quantity of air in each ſtratum, is proportional to the quantity of air above it: and as the whole area MAEN is equal to the rectangle KAEL, ſo the whole air of variable denſity above A might be contained in a column KA, if, inſtead of being compreſſed by its own weight, it were without weight, and compreſſed by an external force equal to the preſſure of the air at the ſurface of the earth. In this caſe, it would be of the uniform denſity AE, which it has at the ſurface of the earth, making what we have repeatedly called the homogeneous atmoſphere.

229 Hence we derive this important circumſtance, that the height of the homogeneous atmoſphere is the ſubtangent of that curve whoſe ordinates are as the denſities of the air at different heights, on the ſuppoſition of equal gravity. This curve may with propriety be called the ATMOSPHERICAL LOGARITHMIC; and as the different logarithmics are all characteriſed by their ſubtangents, it is of importance to determine this one.

It may be done by comparing the denſities of mercury and air. For a column of air of uniform denſity, reaching to the top of the homogeneous atmoſphere, is in equilibrio with the mercury in the barometer. Now it is found, by the beſt experiments, that when mercury and air are of the temperature 32° of Fahrenheit's thermometer, and the barometer ſtands at 30 inches, the mercury is nearly 10440 times denſer than air. Therefore the height of the homogeneous atmoſphere is 10440 times 30 inches, or 26100 feet, or 8700 yards, or 4350 fathoms, or 5 miles wanting 100 yards.

230 Or it may be found by obſervations on the barometer. It is found, that when the mercury and air are of the above temperature, and the barometer on the ſea-ſhore ſtands at 30 inches, if we carry it to a place 884 feet higher it will fall to 29 inches. Now, in all logarithmic curves having equal ordinates, the portions of the axes intercepted between the correſponding pairs of ordinates are proportional to the ſubtangents. And the ſubtangents of the curve belonging to our common tables is 0.4342945, and the difference of the logarithms of 30 and 29 (which is the portion of the axis intercepted between the ordinates 30 and 29), or 0.0147233, is to 0.4342945 as 883 is to 26058 feet, or 8686 yards, or 4343 fathoms, or 5 miles wanting 114 yards This determination is 14 yards leſs than the other, and it is uncertain which is the more exact. It is extremely difficult to

Height of the Atmoſphere.

to meaſure the reſpective denſities of mercury and air; and in meaſuring the elevation which produces a fall of one inch in the barometer, an error of $\frac{1}{10}$ of an inch would produce all the difference. We prefer the laſt, as depending on fewer circumſtances.

231 But all this inveſtigation proceeds on the ſuppoſition of equal gravity, whereas we know that the weight of a particle of air decreaſes as the ſquare of its diſtance from the centre of the earth increaſes. In order, therefore, that a ſuperior ſtratum may produce an equal preſſure at the ſurface of the earth, it muſt be denſer, becauſe a particle of it gravitates leſs. The denſity, therefore, at equal elevations, muſt be greater than on the ſuppoſition of equal gravity, and the law of diminution of denſity muſt be different.

Make $OD : OA = OA : Od$;
$OC : OA = OA : Oc$;
$OB : OA = OA : Ob$; &c.;

ſo that Od, Oc, Ob, OA, may be reciprocals to OD, OC, OB, OA; and through the points A, b, c, d, draw the perpendiculars AE, bf, cg, dh, making them proportional to the denſities in A, B, C, D: and let us ſuppoſe CD to be exceedingly ſmall, ſo that the denſity may be ſuppoſed uniform through the whole ſtratum. Thus we have

$$OD \times Od = OA^2 = OC \times Oc$$
and $Oc : Od = OD : OC$;
and $Oc : Oc - Od = OD : OD - OC$,
or $Oc : cd = OD : DC$;
and $cd : CD = Oc : OD$;

or, becauſe OC and OD are ultimately in the ratio of equality, we have

$$cd : CD = Oc : OC = OA^2 : OC^2,$$

and $cd = CD \times \frac{OA^2}{OC^2}$, and $cd \times cg = CD \times cg \times \frac{OA^2}{OC^2}$;

but $CD \times cg \times \frac{OA^2}{OC^2}$ is as the preſſure at C ariſing from the abſolute weight of the ſtratum CD. For this weight is as the bulk, as the denſity, and as the gravitation of each particle jointly. Now CD expreſſes the bulk, cg the denſity, and $\frac{OA^2}{OC^2}$ the gravitation of each particle. Therefore, $cd \times cg$ is as the preſſure on C ariſing from the weight of the ſtratum DC; but $cd \times cg$ is evidently the element of the curvilineal area AmnE, formed by the curve Efghn and the ordinates AE, bf, cg, ah, &c. mn. Therefore the ſum of all the elements, ſuch as cdhg, that is, the area cmng below cg, will be as the *whole* preſſure on C, ariſing from the gravitation of all the air above it; but, by the nature of air, this whole preſſure is as the denſity which it produces, that is, as cg. Therefore the curve Egn is of ſuch a nature that the area lying below or beyond any ordinate cg is proportional to that ordinate. This is the property of the logarithmic curve, and Egn is a logarithmic curve.

232 But farther, this curve is the ſame with EGN. For let B continually approach to A, and ultimately coincide with it. It is evident that the ultimate ratio of BA to Ab, and of BF to bf, is that of equality; and if EFK, Efk, be drawn, they will contain equal angles with the ordinate AE, and will cut off equal ſubtangents AK, Ak. The curves EGN, Egn are therefore the ſame, but in oppoſite poſitions.

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233 Laſtly, if OA, Ob, Oc, Od, &c. be taken in arithmetical progreſſion decreaſing, their reciprocals OA, OB, OC, OD, &c. will be in harmonical progreſſion increaſing, as is well known: but, from the nature of the logarithmic curve, when OA, Ob, Oc, Od, &c. are in arithmetical progreſſion, the ordinates AE, bf, cg, dh, &c. are in geometrical progreſſion. Therefore when OA, OB, OC, OD, &c. are in harmonical progreſſion, the denſities of the air at A, B, C, D, &c. are in geometrical progreſſion; and thus may the denſity of the air at all elevations be diſcovered. Thus to find the denſity of the air at K the top of the homogeneous atmoſphere, make $OK : OA = OA : OL$, and draw the ordinate LT, LT is the denſity at K.

The celebrated Dr Halley was the firſt who obſerved the relation between the denſity of the air and the ordinates of the logarithmic curve, or common logarithms. This he did on the ſuppoſition of equal gravity; and his diſcovery is acknowledged by Sir Iſaac Newton in *Princip.* ii. *prop.* 22. *ſchol.* Halley's diſſertation on the ſubject is in N° 185 of the Phil. Tranſ. Newton, with his uſual ſagacity, extended the ſame relation to the true ſtate of the caſe, where gravity is as the ſquare of the diſtance inverſely; and ſhowed that when the diſtances from the earth's centre are in harmonic progreſſion, the denſities are in geometric progreſſion. He ſhows indeed, in general, what progreſſion of the diſtance, on any ſuppoſition of gravity, will produce a geometrical progreſſion of the denſities, ſo as to obtain a ſet of lines OA, Ob, Oc, Od, &c. which will be logarithms of the denſities. The ſubject was afterwards treated in a more familiar manner by Cotes in his *Hydroſt. Lect.* and in his *Harmonia Menſurarum*; alſo by Dr Brook Taylor, *Meth. Increment.*; Wolf in his *Aerometria*; Herman in his *Phoronomia*; &c. &c. and lately by Horſley, Phil. Tranſ. tom. lxiv.

234 The air has a finite denſity at an infinite diſtance from the centre of the earth.

An important corollary is deducible from theſe principles, viz. that the air has a finite denſity at an infinite diſtance from the centre of the earth, namely, ſuch as will be repreſented by the ordinate OP drawn through the centre. It may be objected to this concluſion, that it would infer an infinity of matter in the univerſe, and that it is inconſiſtent with the phenomena of the planetary motions, which appear to be performed in a ſpace void of all reſiſtance, and therefore of all matter. But this fluid muſt be ſo rare at great diſtances, that the reſiſtance will be inſenſible, even though the retardation occaſioned by it has been accumulated for ages. Even at the very moderate diſtance of 500 miles, the rarity is ſo great that a cubic inch of common air expanded to that degree would occupy a ſphere equal to the orbit of Saturn; and the whole retardation which this planet would ſuſtain after ſome millions of years would not exceed what would be occaſioned by its meeting one bit of matter of half a grain weight.

This being the caſe, it is not unreaſonable to ſuppoſe the viſible univerſe occupied by air, which, by its gravitation, will accumulate itſelf round every body in it, in a proportion depending on their quantities of matter, the larger bodies attracting more of it than the ſmaller ones, and thus forming an atmoſphere about each. And many appearances warrant this ſuppoſition. Jupiter, Mars, Saturn, and Venus, are evidently ſurrounded by atmoſpheres. The conſtitution of theſe atmoſpheres may differ exceedingly from other cauſes. If the planet

Atmoſpheres of the other Planets, &c.

net has nothing on its ſurface which can be diſſolved by the air or volatilized by heat, the atmoſphere will be continually clear and tranſparent, like that of the moon.

235 The atmoſphere of Mars.

Mars has an atmoſphere which appears preciſely like our own, carrying clouds, or depoſiting ſnows: for when, by the obliquity of his axis to the plane of his ecliptic, he turns his north pole towards the ſun, it is obſerved to be occupied by a broad white ſpot. As the ſummer of that region advances, this ſpot gradually waſtes, and ſometimes vaniſhes, and then the ſouth pole comes in ſight, ſurrounded in like manner with a white ſpot, which undergoes ſimilar changes. This is preciſely the appearance which the ſnowy circumpolar regions of this earth will exhibit to an aſtronomer on Mars. It may not, however, be ſnow that we ſee; thick clouds will have the ſame appearances.

236 Of Jupiter.

The atmoſphere of the planet Jupiter is alſo very ſimilar to our own. It is diverſified by ſtreaks or belts parallel to his equator, which frequently change their appearance and dimenſions, in the ſame manner as thoſe tracts of ſimilar ſky which belong to different regions of this globe. There is a certain kind of weather that more properly belongs to a particular climate than to any other. This is nothing but a certain general ſtate of the atmoſphere which is prevalent there, though with conſiderable variations. This muſt appear to a ſpectator in the moon like a ſtreak ſpread over that climate, diſtinguiſhing it from others. But the moſt remarkable ſimilarity is in the motion of the clouds on Jupiter. They have plainly a motion from eaſt to weſt relative to the body of the planet: for there is a remarkable ſpot on the ſurface of the planet, which is obſerved to turn round the axis in 9h. 51′ 16″; and there frequently appear variable and periſhing ſpots in the belts, which ſometimes laſt for ſeveral revolutions. Theſe are obſerved to circulate in 9. 55. 05. Theſe numbers are the reſults of a long ſeries of obſervations by Dr Herſchel. This plainly indicates a general current of the clouds weſtward, preciſely ſimilar to what a ſpectator in the moon muſt obſerve in our atmoſphere ariſing from the trade-winds. Mr Schroeter has made the atmoſphere of Jupiter a ſtudy for many years; and deduces from his obſervations that the motion of the variable ſpots is ſubject to great variations, but is always from eaſt to weſt. This indicates variable winds.

237 Of Venus.

The atmoſphere of Venus appears alſo to be like ours, loaded with vapours, and in a ſtate of continual change of abſorption and precipitation. About the middle of the 17th century the ſurface of Venus was pretty diſtinctly ſeen for many years chequered with irregular ſpots, which are deſcribed by Campani, Bianchini, and other aſtronomers in the ſouth of Europe, and alſo by Caſſini at Paris, and Hooke and Townley in England. But the ſpots became gradually more faint and indiſtinct; and, for near a century, have diſappeared. The whole ſurface appears now of one uniform brilliant white. The atmoſphere is probably filled with a reflecting vapour, thinly diffuſed through it, like water faintly tinged with milk. A great depth of this muſt appear as white as a ſmall depth of milk itſelf; and it appears to be of a *very great* depth, and to be refractive like our air. For Dr Herſchel has obſerved, by the help of his fine teleſcopes, that the illuminated part of Venus is conſiderably more than a hemiſphere, and that the light dies gradually away to the bounding margin. This is the very appearance that the earth would make if furniſhed with ſuch an atmoſphere. The boundary of illumination would have a penumbra reaching about nine degrees beyond it. If this be the conſtitution of the atmoſphere of Venus, ſhe may be inhabited by beings like ourſelves. They would not be dazzled by the intolerable ſplendour of a ſun four times as big and as bright, and ſixteen times more glaring, than ours: for they would ſeldom or never ſee him, but inſtead of him an uniformly bright and white ſky. They would probably never ſee a ſtar or planet, unleſs the dog-ſtar and Mercury; and perhaps the earth might pierce through the bright haze which ſurrounds their planet. For the ſame reaſon the inhabitants would not perhaps be incommoded by the ſun's heat. It is indeed a very queſtionable thing, whether the ſun would cauſe any heat, even here, if it were not for the chemical action of his rays on our air. This is rendered not improbable by the intenſe cold felt on the tops of the higheſt mountains, in the cleareſt air, and even under a vertical ſun in the torrid zone.

238 And of comets.

The atmoſphere of comets ſeems of a nature totally different. This ſeems to be of inconceivable rarity, even when it reflects a very ſenſible light. The tail is always turned nearly away from the ſun. It is thought that this is by the impulſe of the ſolar rays. If this be the caſe, we think it might be diſcovered by the aberration and the refraction of the light by which we ſee the tail: for this light muſt come to our eye with a much ſmaller velocity than the ſun's light, if it be reflected by repulſive or elaſtic forces, which there is every reaſon in the world to believe; and therefore the velocity of the reflected light will be diminiſhed by all the velocity communicated to the reflecting particles. This is almoſt inconceivably great. The comet of 1680 went half round the ſun in ten hours, and had a tail at leaſt a hundred millions of miles long, which turned round at the ſame time, keeping nearly in the direction oppoſite to the ſun. The velocity neceſſary for this is prodigious, approaching to that of light. And perhaps the tail extends much farther than we ſee it, but is viſible only as far as the velocity with which its particles recede from the ſun is leſs than a certain quantity, namely, what would leave a ſufficient velocity for the reflected light to enable it to affect our eyes. And it may be demonſtrated, that although the real form of the viſible tail is concave on the anterior ſide to which the comet is moving, it may appear convex on that ſide, in conſequence of the very great aberration of the light by which the remote parts are ſeen. All this may be diſcovered by properly contrived obſervations; and the conjecture merits attention. But of this digreſſion there is enough; and we return to our ſubject, the conſtitution of our air.

239 The barometer uſed in taking heights.

We have ſhown how to determine *à priori* the denſity of the air at different elevations above the ſurface of the earth. But the denſities may be diſcovered in all acceſſible elevations by experiments; namely, by obſerving the heights of the mercury in the barometer. This is a direct meaſure of the preſſure of the incumbent atmoſphere; and this is proportional to the denſity which it produces.

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Therefore, by means of the relation ſubſiſting between the denſities and the elevations, we can diſcover the elevations by obſervations made on the denſities by means of

of

of the barometer; and thus we may meaſure elevations by means of the barometer; and, with very little trouble, take the level of any extenſive tract of country. Of this we have an illuſtrious example in the ſection which the Abbé Chappe D'Auteroche has given of the whole country between Breſt and Ekaterineburgh in Siberia. This is a ſubject which deſerves a minute conſideration: we ſhall therefore preſent it under a very ſimple and familiar form; and trace the method through its various ſteps of improvement by De Luc, Roy, Shuckburgh, &c.

241 Explanation of its uſe, &c.

We have already obſerved, oftener than once, that if the mercury in the barometer ſtands at 30 inches, and if the air and mercury be of the temperature 32° in Fahrenheit's thermometer, a column of air 87 feet thick has the ſame weight with a column of mercury $\frac{1}{10}$ of an inch thick. Therefore, if we carry the barometer to a higher place, ſo that the mercury ſinks to 29.9, we have aſcended 87 feet. Now, ſuppoſe we carry it ſtill higher, and that the mercury ſtands at 29.8; it is required to know what height we have now got to? We have evidently aſcended through another ſtratum of equal weight with the former: but it muſt be of greater thickneſs, becauſe the air in it is rarer, being leſs compreſſed. We may call the denſity of the firſt ſtratum 300, meaſuring the denſity by the number of tenths of an inch of mercury which its elaſticity proportional to its denſity enables it to ſupport. For the ſame reaſon, the denſity of the ſecond ſtratum muſt be 299: but when the weights are equal, the bulks are inverſely as the denſities; and when the baſes of the ſtrata are equal, the bulks are as the thickneſſes. Therefore, to obtain the thickneſs of this ſecond ſtratum, ſay 299 : 300 = 87 : 87.29; and this fourth term is the thickneſs of the ſecond ſtratum, and we have aſcended in all 174.29 feet. In like manner we may riſe till the barometer ſhows the denſity to be 298: then ſay 298 : 30 = 87 : 87.584 for the thickneſs of the third ſtratum, and 261,875 or 261$\frac{7}{8}$ for the whole aſcent; and we may proceed in the ſame way for any number of mercurial heights, and make a table of the correſponding elements as follows: Where the firſt column is the height of the mercury in the barometer, the ſecond column is the thickneſs of the ſtratum, or the elevation above the preceding ſtation; and the third column is the whole elevation above the firſt ſtation.

Bar.	Strat.	Elev.
30	00.000	00.000
29.9	87.000	87.000
29.8	87.291	174.291
29.7	87.584	261.875
29.6	87.879	349.754
29.5	88.176	437.930
29.4	88.475	526.405
29.3	88.776	615.181
29.2	89.079	704.260
29.1	89.384	793.644
29	89.691	883.335

242 Having done this, we can now meaſure any elevation within the limits of our table, in this manner.

Obſerve the barometer at the lower and at the upper ſtations, and write down the correſponding elevations. Subtract the one from the other, and the remainder is the height required. Thus ſuppoſe that at the lower ſtation the mercurial height was 29.8, and that at the upper ſtation it was 29.1

29.1	793.644
29.8	174.291
	619.353 = Elevation.

We may do the ſame thing with tolerable accuracy without the table, by taking the medium m of the mercurial heights, and their difference d in tenths of an inch; and then ſay, as m to 300, ſo is $87\,d$ to the height required h: or $h = \frac{300 \times 87 d}{m} = \frac{26100 d}{m}$. Thus, in the foregoing example, m is 294.5, and d is $= 7$; and therefore $h = \frac{7 \times 26100}{294.5} = 620.4$, differing only one foot from the former value.

Either of theſe methods is ſufficiently accurate for moſt purpoſes, and even in very great elevations will not produce any error of conſequence: the whole error of the elevation 883 feet 4 inches, which is the extent of the above table, is only $\frac{1}{4}$ of an inch.

But we need not confine ourſelves to methods of approximation, when we have an accurate and ſcientific method that is equally eaſy. We have ſeen that, upon the ſuppoſition of equal gravity, the denſities of the air are as the ordinates of a logarithmic curve, having the line of elevations for its axis. We have alſo ſeen that, in the true theory of gravity, if the diſtances from the centre of the earth increaſe in a harmonic progreſſion, the logarithm of the denſities will decreaſe in an arithmetical progreſſion; but if the greateſt elevation above the ſurface be but a few miles, this harmonic progreſſion will hardly differ from an arithmetical one. Thus, if A b, A c, A d, are 1, 2, and 3 miles, we ſhall find that the correſponding elevations AB, AC, AD are ſenſibly in arithmetical progreſſion alſo; for the earth's radius AC is nearly 4000 miles. Hence it plainly follows that BC—AB is $\frac{1}{4000 \times 4001}$, or $\frac{1}{16004000}$ of a mile, or $\frac{1}{250}$ of an inch; a quantity quite inſignificant. We may therefore affirm without heſitation, that in all acceſſible places, the elevations increaſe in an arithmetical progreſſion, while the denſities decreaſe in a geometrical progreſſion. Therefore the ordinates are proportional to the numbers which are taken to meaſure the denſities, and the portions of the axis are proportional to the logarithms of theſe numbers. It follows, therefore, that we may take ſuch a ſcale for meaſuring the denſities that the logarithms of the numbers of this ſcale ſhall be the very portions of the axis; that is, of the vertical line in feet, yards, fathoms, or what meaſure we pleaſe: and we may, on the other hand, chooſe ſuch a ſcale for meaſuring our elevations, that the logarithms of our ſcale of denſities ſhall be parts of this ſcale of elevations; and we may find either of theſe ſcales ſcientifically. For it is a known property of the logarithmic curves, that when the ordinates are the ſame, the intercepted portion of the abſciſſæ are proportioned to their ſubtangents. Now we know the ſubtangent of the atmoſpherical logarithmic: it is the height of the homogeneous atmoſphere in any meaſure we pleaſe, ſuppoſe fathoms: we find this height by comparing the gravities of air and mercury, when both 243

 both are of ſome determined denſity. Thus, in the temperature of 32° of Fahrenheit's thermometer, when the barometer ſtands at 30 inches, it is known (by many experiments) that mercury is 10423.068 times heavier than air; therefore the height of the balancing column of homogeneous air will be 10423.068 times 30 inches; that is, 4342.945 Engliſh fathoms. Again, it is known that the ſubtangent of our common logarithmic tables, where 1 is the logarithm of the number 10, is 0.4342945. Therefore the number 0.4342945 is to the difference D of the logarithms of any two barometric heights as 4342.945 fathoms are to the fathoms F contained in the portion of the axis of the atmoſpherical logarithmic, which is intercepted between the ordinates equal to theſe barometrical heights; or that 0.4342945 : D = 4342.945 : F, and 0.4342.945 : 4342.945 = D : F; but 0.4342945 is the ten-thouſandth part of 4342.945, and therefore D is the ten-thouſandth part of F.

244 And thus it happens, by mere chance, that the logarithms of the denſities, meaſured by the inches of mercury which their elaſticity ſupports in the barometer, are juſt the ten-thouſandth part of the fathoms contained in the correſponding portions of the axis of the atmoſpherical logarithmic. Therefore, if we multiply our common logarithms by 10000, they will expreſs the fathoms of the axis of the atmoſpherical logarithmic; nothing is more eaſily done. Our logarithms contain what is called the index or characteriſtic, which is an integer and a number of decimal places. Let us juſt remove the integer-place four figures to the right hand: thus the logarithm of 60 is 1.7781513, which is one integer and $\frac{7781513}{10000000}$. Multiply this by 10.000, and we obtain $\frac{513}{1001}$ 17781.513, or 17781 $\frac{513}{1000}$.

245 The practical application of all this reaſoning is obvious and eaſy: obſerve the heights of the mercury in the barometer at the upper and lower ſtations in inches and decimals; take the logarithms of theſe, and ſubtract the one from the other: the difference between them (accounting the four firſt decimal figures as integers) is the difference of elevation of fathoms.

Example.

Merc. Height at the lower ſtation	29.8	1.4742163
upper ſtation	29.1	1.4638930
Diff. of Log. × 10000		0.0103.233

or 103 fathoms and $\frac{233}{1000}$ of a fathom, which is 619.392 feet, or 619 feet 4½ inches; differing from the approximated value formerly found about ½ an inch.

246 This method of meaſuring heights now much improved.

Such is the general nature of the barometric meaſurement of heights firſt ſuggeſted by Dr Halley; and it has been verified by numberleſs compariſons of the heights calculated in this way with the ſame heights meaſured geometrically. It was indeed in this way that the preciſe ſpecific gravity of air and mercury was moſt accurately determined; namely, by obſerving, that when the temperature of air and mercury was 32, the difference of the logarithms of the mercurial heights were preciſely the fathoms of elevation. But it requires many corrections to adjuſt this method to the circumſtances of the caſe; and it was not till very lately that it has been ſo far adjuſted to them as to become uſeful. We are chiefly indebted to Mr de Luc for the improvements. The great elevations in Switzerland enabled him to make an immenſe number of obſervations, in almoſt every variety of circumſtances. Sir George Shuckburgh alſo made a great number with moſt accurate inſtruments in much greater elevations, in the ſame country; and he made many chamber experiments for determining the laws of variation in the ſubordinate circumſtances. General Roy alſo made many to the ſame purpoſe. And to theſe two gentlemen we are chiefly obliged for the corrections which are now generally adopted.

It is eaſy to perceive that the method, as already expreſſed, cannot apply to every caſe: it depends on the ſpecific gravity of air and mercury, combined with the ſuppoſition that this is affected *only by a change of preſſure*. But ſince all bodies are expanded by heat, and as there is no reaſon to ſuppoſe that they are equally expanded by it, it follows that a change of temperature will change the relative gravity of mercury and air, even although both ſuffer the ſame change of temperature: and ſince the air may be warmed or cooled when the mercury is not, or may change its temperature independent of it, we may expect ſtill greater variations of ſpecific gravity. 247 It depends on the ſpecific gravity of air and mercury.

The general effect of an augmentation of the ſpecific gravity of the mercury muſt be to increaſe the ſubtangent of the atmoſpherical logarithmic; in which caſe the logarithms of the denſities, as meaſured by inches of mercury, will expreſs meaſures that are greater than fathoms in the ſame proportion that the ſubtangent is increaſed; or, when the air is more expanded than the mercury, it will require a greater height of homogeneous atmoſphere to balance 30 inches of mercury, and a given fall of mercury will then correſpond to a thicker ſtratum of air.

In order, therefore, to perfect this method, we muſt learn by experiment how much mercury expands by an increaſe of temperature; we muſt alſo learn how much the air expands by the ſame, or any change of temperature; and how much its elaſticity is affected by it. Both theſe circumſtances muſt be conſidered in the caſe of air; for it might happen that the elaſticity of the air is not ſo much affected by heat as its bulk is.

It will, therefore, be proper to ſtate in this place the experiments which have been made for aſcertaining theſe two expanſions.

The moſt accurate, and the beſt adapted experiments for aſcertaining the expanſion of mercury, are thoſe of General Roy, publiſhed in the 67th volume of the Philoſophical Tranſactions. He expoſed 30 inches of mercury, actually ſupported by the atmoſphere in a barometer, in a nice apparatus, by which it could be made of one uniform temperature through its whole length; and he noted the expanſion of it in decimals of an inch. Theſe are contained in the following table; where the firſt column expreſſes the temperature by Fahrenheit's thermometer, the ſecond column expreſſes the bulk of the mercury, and the third column the expanſion of an inch of mercury for an increaſe of one degree in the adjoining temperatures. 248 General Roy's experiments on the expanſion of mercury.

Barometer.

TABLE A.

Temp.	Bulk of ☿.	Expan. for 1°.
212°	30.5117	0.0000763
202	30.4888	0.0000787
192	30.4652	0.0000810
182	30.4409	0.0000833
172	30.4159	0.0000857
162	30.3902	0.0000880
152	30.3638	0.0000903
142	30.3367	0.0000923
132	30.3090	0.0000943
122	30.2807	0.0000963
112	30.2518	0.0000983
102	30.2223	0.0001003
92	30.1922	0.0001023
82	30.1615	0.0001043
72	30.1302	0.0001063
62	30.0984	0.0001077
52	30.0661	0.0001093
42	30.0333	0.0001110
32	30.0000	0.0001127
22	29.9662	0.0001143
12	29.9319	0.0001160
2	29.8971	0.0000177
0	29.8901	

249 This table gives rife to fome reflections. The fcale of the thermometer is conftructed on the fuppofition that the fucceffive degrees of heat are meafured by equal increments of bulk in the mercury of the thermometer. How comes it, therefore, that this is not accompanied by equal increments of bulk in the mercury of the column, but that the correfponding expanfions of this column do continually diminifh: General Roy attributes this to the gradual detachment of elaftic matter from the mercury by heat, which preffes on the top of the column, and therefore fhortens it. He applied a boiling heat to the vacuum a-top, without producing any farther depreffion; a proof that the barometer had been carefully filled. It had indeed been boiled through its whole length. He had attempted to meafure the mercurial expanfion in the ufual way, by filling 30 inches of the tube with boiled mercury, and expofing it to the heat with the open end uppermoft. But here it is evident that the expanfion of the tube, and its folid contents, muft be taken into the account. The expanfion of the tube was found fo exceedingly irregular, and fo incapable of being determined with precifion for the tubes which were to be employed, that he was obliged to have recourfe to the method with the real barometer. In this no regard was neceffary to any circumftance but the perpendicular height. There was, befides, a propriety in examining the mercury in the very condition in which it was ufed for meafuring the preffure of the atmofphere; becaufe, whatever complication there was in the refults, it was the fame in the barometer in actual ufe.

250 The moft obvious manner of applying thefe experiments on the expanfion of mercury to our purpofe, is to reduce the obferved height of the mercury to what it would have been if it were of the temperature 32. Thus, fuppofe that the obferved mercurial height is 29.2, and that the temperature of the mercury is 72°, make 30.1302 : 30=29.2 : 29.0738. This will be the true meafure of the denfity of the air of the ftandard temperature. In order that we may obtain the exact temperature of the mercury, it is proper that the obfervation be made by means of a thermometer attached to the barometer-frame, fo as to warm and cool along with it.

Taking heights.

Or, this may be done without the help of a table, and with fufficient accuracy, from the circumftance that the expanfion of an inch of mercury for one degree diminifhes very nearly $\frac{1}{1000}$th part in each fucceeding degree. If therefore we take from the expanfion at 32° its thoufandth part for each degree of any range above it, we obtain a mean rate of expanfion for that range. If the obferved temperature of the mercury is below 32°, we muft *add* this correction to obtain the mean expanfion. This rule will be made more exact if we fuppofe the expanfion at 32° to be =0.0001127. Then multiply the obferved mercurial height by this expanfion, and we obtain the correction, to be fubtracted or added according as the temperature of the mercury was above or below 32°. Thus to abide by the former example of 72°. This exceeds 32° by 40: therefore take 40 from 0.0001127, and we have 0.0001087 for the medium expanfion for that range. Multiply this by 40, and we have the whole expanfion of one inch of mercury, =0.004348. Multiply the inches of mercurial height, viz. 29.2 by this expanfion, and we have for the correction 0.12696; which being fubtracted from the obferved height leaves 29.07304, differing from the accurate quantity lefs than the thoufandth part of an inch. This rule is very eafily kept in the memory, and fuperfedes the ufe of a table. 251

252 This correction may be made with all neceffary exactnefs by a rule ftill more fimple; namely, by multiplying the obferved height of the mercury by the difference of its temperature from 32°, and cutting off four cyphers before the decimals of the mercurial height. This will feldom err $\frac{1}{100}$ of an inch. We even believe that it is the moft exact method within the range of temperatures that can be expected to occur in meafuring heights: for it appears, by comparing many experiments and obfervations, that General Roy's meafure of the mercurial expanfion is too great, and that the expanfion of an inch of mercury between 20° and 70° of Fahrenheit's thermometer does not exceed 0.000102 per degree. Having thus corrected the obferved mercurial heights by reducing them to what they would have been if the mercury had been of the ftandard temperature, the logarithms of the corrected heights are taken, and their difference, multiplied by 10000, will give the difference of elevations in Englifh fathoms.

253 There is another way of applying this correction, fully more expeditious and equally accurate. The difference of the logarithms of the mercurial heights is the meafure of the ratio of thofe heights. In like manner the difference of the logarithms of the obferved and corrected heights at any ftation is the meafure of the ratio of thofe heights. Therefore this laft difference of the logarithms is the meafure of the correction of this ratio. Now the obferved height is to the corrected height nearly as 1 to 1.000102. The logarithm of this ratio, or the difference of the logarithms of 1 and 1.000102, is 0.0000444. This is the correction for each degree that

Barometer. that the temperature of the mercury differs from 32. Therefore multiply 0.0000444 by the difference of the mercurial temperatures from 32, and the products will be the corrections of the respective logarithms.

254 But there is still an easier way of applying the logarithmic correction. If both the mercurial temperatures are the same, the differences of their logarithms will be the same, although each may be a good deal above or below the standard temperature, if the expansion be very nearly equable. The correction will be necessary only when the temperatures at the two stations are different, and will be proportional to this difference. Therefore, if the difference of the mercurial temperatures be multiplied by 0.0000444, the product will be the correction to be made on the difference of the logarithms of the mercurial heights.

But farther, since the differences of the logarithms of the mercurial heights are also the differences of elevation in English fathoms, it follows that the correction is also a difference of elevation in English fathoms, or that the correction for one degree of difference of mercurial temperature is $\frac{444}{1000}$ of a fathom, or 32 inches, or 2 feet 8 inches.

This correction of 2.8 for every degree of difference of temperature must be subtracted from the elevation found by the general rate, when the mercury at the upper station is colder than that at the lower. For when this is the case, the mercurial column at the upper station will appear too short, the pressure of the atmosphere too small, and therefore the elevation in the atmosphere will appear greater than it really is.

255 Therefore the rule for this correction will be to multiply 0.0000444 by the degrees of difference between the mercurial temperatures at the two stations, and to add or subtract the product from the elevation found by the general rule, according as the mercury at the upper station is hotter or colder than at the lower.

256 If the experiments of General Roy on the expansion of the mercury in a real barometer be thought most deserving of attention, and the expansion be considered as variable, the logarithmic difference corresponding to this expansion for the *mean* temperature of the two barometers may be taken. These logarithmic differences are contained in the following table, which is carried as far as 112°, beyond which it is not probable that any observations will be made. The number for each temperature is the difference between the logarithms of 30 inches of the temperature 32, and of 30 inches expanded by that temperature.

TABLE B.

Temp.	Log. diff.	Dec. of Fath.	Ft. In.
112°	0.0000427	.427	2.7
102	0.0000436	.436	2.7
92	0.0000444	.444	2.8
82	0.0000453	.453	2.9
72	0.0000460	.460	2.9
62	0.0000468	.468	2.10
52	0.0000475	.475	2.10
42	0.0000482	.482	2.11
32	0.0000489	.489	2.11
22	0.0000497	.497	3.0
12	0.0000504	.504	3.0
0			

It is also necessary to attend to the temperature of the air; and the change that is produced by heat in its density is of much greater consequence than that of the mercury. The relative gravity of the two, on which the subtangent of the logarithmic curve depends, and consequently the unit of our scale of elevations, is much more affected by the heat of the air than by the heat of the mercury. — Taking heights. — 257 The temperature of the air must also be attended to.

This adjustment is of incomparably greater difficulty than the former, and we can hardly hope to make it perfect. We shall narrate the chief experiments which have been made on the expansion of air, and deduce from them such rules as appear to be necessary consequences of them, and then notice the circumstances which leave the matter still imperfect.

258 General Roy compared a mercurial and an air thermometer, each of which was graduated arithmetically, that is, the units of the scales were equal bulks of mercury, and equal bulks (perhaps different from the former) of air. He found their progress as in the following table. — Comparison of a mercurial and air thermometer.

TABLE C.

Merc.	Diff.	Air.	Diff.
212	20	212.0	17.6
192	20	194.4	18.2
172	20	176.2	18.8
152	20	157.4	19.4
132	20	138.0	20.0
112	20	118.0	20.8
92	20	97.2	21.6
72	20	75.6	22.6
52	20	53.0	21.6
32	20	31.4	20.0
12		11.4	

259 It has been established by many experiments that equal increments of heat produce equal increments in the bulk of mercury. The differences of temperature are therefore expressed by the second column, and may be considered as equal; and the numbers of the third column must be allowed to express the same temperatures with those of the first. They *directly* express the *bulks* of the air, and the numbers of the fourth column express the difference of these bulks. These are evidently unequal, and show that common air expands most of all when of the temperature 62 nearly.

260 The next point was to determine what was the *actual* increase of bulk by some known increase of heat. For this purpose he took a tube, having a narrow bore, and a ball at one end. He measured with great care the capacity of both the ball and the tube, and divided the tube into equal spaces which bore a determined proportion to the capacity of the ball. This apparatus was set in a long cylinder filled with frigorific mixtures or with water, which could be uniformly heated up to the boiling temperature, and was accompanied by a nice thermometer. The expansion of the air was measured by means of a column of mercury which rose or sunk in the tube. The tube being of a small bore, the mercury did not drop out of it; and the bore being chosen as equable as possible, this column remained of an uniform length, whatever part of the tube it chanced to occupy. By this contrivance he was able to examine the — To determine an actual increase of bulk from a known increase of heat.

Barometer. the expanſibility of air of various denſities. When the column of mercury contained only a ſingle drop or two, the air was nearly of the denſity of the external air. If he wiſhed to examine the expanſion of air twice or thrice as denſe, he uſed a column of 30 or 60 inches long; and to examine the expanſion of air that is rarer than the external air, he placed the tube with the ball uppermoſt, the open end coming through a hole in the bottom of the veſſel containing the mixtures or water. By this poſition the column of mercury was hanging in the tube, ſupported by the preſſure of the atmoſphere; and the elaſticity of the included air was meaſured by the difference between the ſuſpended column and the common barometer.

261 The following table contains an expanſion of 1000 parts of air, nearly of the common denſity, by heating it from 0 to 212. The firſt column contains the height of the barometer; the ſecond contains this height augmented by the ſmall column of mercury in the tube of the manometer, and therefore expreſſes the denſity of the air examined; the third contains the total expanſion of 1000 parts; and the fourth contains the expanſion for 1°, ſuppoſing it uniform throughout.

TABLE D.

Barom.	Denſity of Air examined.	Expanſion of 1000 pts by 212°.	Expanſion by 1°.
29.95	31.52	483.89	2.2825
30.07	30.77	482.10	2.2741
29.48	29.90	480.74	2.2676
29.90	30.73	485.86	2.2918
29.96	30.92	489.45	2.3087
29.90	30.55	476.04	2.2455
29.95	30.60	487.55	2.2998
30.07	30.60	482.80	2.2774
29.48	30.00	489.47	2.3087
Mean	30.62	484.21	2.2840

Hence it appears, that the mean expanſion of 1000 parts of air of the denſity 30.62 by one degree of Fahrenheit's thermometer is 2.284, or that 1000 becomes 1002.284.

262 If this expanſion be ſuppoſed to follow the ſame rate that was obſerved in the compariſon of the mercurial and air thermometer, we ſhall find that the expanſion of a thouſand parts of air for one degree of heat at the different intermediate temperatures will be as in the following table.

TABLE E.

Temp.	Total Expanſion.	Expanſion for 1°.	Temp.	Total Expanſion.	Expanſion for 1°.
212	484.210	2.0099	72	172.671	2.5581
192	444.011	2.0080	62	147.090	2.6037
172	402.452	2.1475	52	121.053	2.5124
152	359.503	2.2155	42	95.929	2.4211
132	315.193	2.2840	32	71.718	2.3297
112	269.513	2.3754	22	48.421	2.2383
92	222.006	2.4211	12	26.038	2.1698
82	197.795	2.5124	0		
72	172.671				

If we would have a mean expanſion for any particular range, as between 12° and 92°, which is the moſt likely to comprehend all the geodætical obſervations, we need only take the difference of the bulks 26.038 and 222.006.=195.968, and divide this by the interval of temperature 80°, and we obtain 2.4496, or 2.45 for the mean expanſion for 1°. Taking heights.

It would perhaps be better to adapt the table to a maſs of 1000 parts of air of the ſtandard temperature 32°; for in its preſent form it ſhows the expanſibility of air originally of the temperature 0. This will be done with ſufficient accuracy by ſaying (for 212°) 1071.718 : 1484.210=1000. : 13849, and ſo of the reſt. Thus we ſhall conſtruct the following table of the expanſion of 10,000 parts of air. 263

TABLE F.

Temp.	Bulk.	Differ.	Expanſ. for 1°.
212	13489	375	18.7
192	13474	387	19.3
172	13087	392	19.6
152	12685	413	20.6
132	12272	426	21.3
112	11846	443	22.1
92	11403	226	22.6
82	11177	235	23.5
72	10942	238	23.8
62	10704	243	24.3
52	10461	235	23.5
42	10226	226	22.6
32	10000	217	21.7
22	9783	209	20.9
12	9574	243	20.2
0	9331		

This will give for the mean expanſion of 1000 parts of air between 12° and 92=2.29.

264 General Roy's experiments on air above the common denſity.

Although it cannot happen that in meaſuring the differences of elevation near the earth's ſurface, we ſhall have occaſion to employ air greatly exceeding the common denſity, we may inſert the experiments made by General Roy on ſuch airs. They are expreſſed in the following table; where column firſt contains the denſities meaſured by the inches of mercury that they will ſupport when of the temperature 32°: column ſecond is the expanſion of 1000 parts of ſuch air by being heated from 0 to 212; and column third is the mean expanſion for 1°.

TABLE G.

Denſity.	Expanſion for 212.	Expanſ. for 1°.
101.7	451.54	2.130
92.3	423.23	1.996
80.5	412.09	1.944
54.5	439.87	2.075
49.7	443.24	2.091
Mean 75.7	434	2.047

265 And on air below that denſity.

We have much more frequent occaſion to operate in air that is rarer than the ordinary ſtate of the ſuperficial atmoſphere.

Barometer. atmosphere. General Roy accordingly made many experiments on such airs. He found in general, that their expansibility by heat was analogous to that of air in its ordinary density, being greatest about the temperature 60°. He found, too, that its expansibility by heat diminished with its density, but he could not determine the law of gradation. When reduced to about one-fifth of the density of common air, its expansion was as follows.

TABLE II.

Temp.	Bulk.	Difference	Expansion for 1°.
212	1141.504	7.075	0.354
192	1134.429	12.264	0.613
172	1122.165	14.150	0.708
152	1108.015	14.151	0.708
132	1093.864	14.228	0.711
112	1079.636	14.937	0.747
92	1064.699	20.911	1.045
72	1043.788	25.943	1.297
52	1017.845	17.845	0.892
32	1000.000		
	Mean expansion		0.7866

266 Air of ordinary density expands most, &c.

From this very extensive and judicious range of experiments, it is evident that the expansibility of air by heat is greatest when the air is about its ordinary density, and that in small densities it is greatly diminished. It appears also, that the law of compression is altered; for in this specimen of the rare air half of the whole expansion happens about the temperature 99°, but in air of ordinary density at 105°. This being the case, we see that the experiments of Mr Amontons, narrated in the Memoirs of the Academy at Paris 1702, &c. are not inconsistent with those more perspicuous experiments of General Roy. Amontons found, that whatever was the density of the air, at least in cases much denser than ordinary air, the change of 180° of temperature increased its elasticity in the same proportion: for he found, that the column of mercury which it supported when of the temperature 50, was increased one-third at the temperature 212. Hence he hastily concluded, that its expansibility was increased in the same proportion; but this by no means follows, unless we are certain that in every temperature the elasticity is proportional to the density. This is a point which still remains undecided; and it merits attention, because if true it establishes a remarkable law concerning the action of heat, which would seem to go to prove that the elasticity of fluids is the property of the matter of fire, which it superinduces on every body with which it combines in the form of vapour.

267 The height which produces a given fall in the barometer, increases with the air's expansion.

After this account of the expansion of air, we see that the height through which we must rise in order to produce a given fall of the mercury in the barometer, or the thickness of the stratum of air equiponderant with a tenth of an inch of mercury, must increase with the expansion of air; and that if $\frac{2.29}{1000}$ be the expansion for one degree, we must multiply the excess of the temperature of the air above 32° by 0.00229, and multiply the product by 87, in order to obtain the thickness of the stratum where the barometer stands at 30 inches: or whatever be the elevation indicated by the difference of the barometrical heights, upon the supposition that the air is of the temperature 32°, we must multiply this by 0.00229 for every degree that the air is warmer or colder than 32. The product must be added to the elevation in the first case, and subtracted in the latter.

Taking heights.

Sir George Shuckburgh deduces 0.0024 from his experiments as the mean expansion of air in the ordinary cases: and this is probably nearer the truth; because General Roy's experiments were made on air which was freer from damp than the ordinary air in the fields: and it appears from his experiments, that a very minute quantity of damp increases its expansibility by heat in a prodigious degree. 268

269 Difficulties in this mode of measuring heights.

The great difficulty is how to apply this correction; or rather, how to determine the temperature of the air in those extensive and deep strata in which the elevations are measured. It seldom or never happens that the stratum is of the same temperature throughout. It is commonly much colder aloft; it is also of different constitutions. Below it is warm, loaded with vapour, and very expansible; above it is cold, much drier, and less expansible, both by its dryness and its rarity. The currents of wind are often disposed in strata, which long retain their places; and as they come from different regions, are of different temperatures and different constitutions. We cannot therefore determine the expansion of the whole stratum with precision, and must content ourselves with an approximation: and the best approximation that we can make is, by supposing the whole stratum of a mean temperature between those of its upper and lower extremity, and employ the expansion corresponding to that mean temperature.

This, however, is founded on a gratuitous supposition, that the whole intermediate stratum expands alike, and that the expansion is equable in the different intermediate temperatures; but neither of these is warranted by experiment. Rare air expands less than what is denser; and therefore the general expansion of the whole stratum renders its density more uniform. Dr Horsley has pointed out some curious consequences of this in Phil. Transf. vol. lxiv. There is a particular elevation at which the general expansion, instead of diminishing the density of the air, increases it by the superior expansion of what is below; and we know that the expansion is not equable in the intermediate temperatures: but we cannot find out a rule which will give us a more accurate correction than by taking the expansion for the mean temperature.

When we have done this, we have carried the method of measuring heights by the barometer as far as it can go; and this source of remaining error makes it needless to attend to some other very minute equations which theory points out. Such is the diminution of the weight of the mercury by the change of distance from the centre of the earth. This accompanies the diminution of the weight of the air, but neither so as to compensate it, nor to go along with it *peri passu*.

After all, there are found cases where there is a regular deviation from those rules, of which we cannot give any very satisfactory account. Thus it is found, that in the province of Quito in Peru, which is at a great elevation above the surface of the ocean, the heights obtained by these rules fall considerably short of the

Barometer. the real heights; and at Spitsbergen they considerably exceed them. It appears that the air in the circumpolar regions is denser than the air of the temperate climates when of the same heat and under the same pressure; and the contrary seems to be the case with the air in the torrid zone. It would seem that the specific gravity of air to mercury is at Spitsbergen about 1 to 10224, and in Peru about 1 to 13100. This difference is with great probability ascribed to the greater dryness of the circumpolar air.

This source of error will always remain; and it is combined with another, which should be attended to by all who practise this method of measuring heights, namely, a difference in the specific gravity of the quicksilver. It is thought sufficiently pure for a barometer when it is cleared of all calcinable matter, so as not to drag or sully the tube. In this state it may contain a considerable portion of other metals, particularly of silver, bismuth, and tin, which will diminish its specific gravity. It has been obtained by revivification from cinnabar of the specific gravity 14.229, and it is thought very fine if 13.65. Sir George Shuckburgh found the quicksilver which agreed precisely with the atmospherical observations on which the rules are founded, to have the specific gravity 13.61. It is seldom obtained so heavy. It is evident that these variations will change the whole results; and that it is absolutely necessary, in order to obtain precision, that we know the density of the mercury employed. The subtangent of the atmospherical logarithmic, or the height of the homogeneous atmosphere, will increase in the same proportion with the density of the mercury; and the elevation corresponding to one-tenth of an inch of barometric height will change in the same proportion.

We must be contented with the remaining imperfections: and we can readily see, that, for any purpose that can be answered by such measurements of great heights, the method is sufficiently exact; but it is quite inadequate to the purpose of taking accurate levels, for directing the construction of canals, aqueducts, and other works of this kind, where extreme precision is absolutely necessary.

We shall now deduce from all that has been said on this subject sets of easy rules for the practice of this mode of measurement, illustrating them by an example.

270 Mode of measuring heights by the barometer according to De Luc,

1. M. DE LUC's *Method*.

I. Subtract the logarithm of the barometrical height at the upper station from the logarithm of that at the lower, and count the index and four first decimal figures of the remainder as fathoms, the rest as a decimal fraction. Call this the *elevation*.

II. Note the different temperatures of the mercury at the two stations, and the mean temperature. Multiply the logarithmic expansion corresponding to this mean temperature (in Table B, p. 709.) by the difference of the two temperatures, and subtract the product from the elevation if the barometer has been coldest at the upper station, otherwise add it. Call the difference or the sum the *approximated elevation*.

III. Note the difference of the temperatures of the air at the two stations by a detached thermometer, and also the mean temperature and its difference from 32°. Multiply this difference by the expansion of air for the mean temperature, and multiply the approximate elevation by $f \pm$ this product, according as the air is above or below 32°. The product is the correct elevation in fathoms and decimals. Measuring heights.

Example.

Suppose that the mercury in the barometer at the lower station was at 29.4 inches, that its temperature was 50°, and the temperature of the air was 45; and let the height of the mercury at the upper station be 25.19 inches, its temperature 46, and the temperature of the air 39. Thus we have

☿al Hts.	Temp. ☿.	Mean.	Temp. Air.	Mean.
29.4	50		45	
25.19	464	48	30	42

I. Log. of 29.4 - - -		1.4683473
Log. of 25.19 - -		1.4012282
Elevation in fathoms -		671.191
II. Expans. for 48°	.473	
Multiply -	4	
	-	1.892
Approximated elevation -		669.299
III. Expans. of air at 42	0.00238	
×42—32,=10°	10	
	0.0238	
Multiply - -		669.2990
By - - -		1.0238
Product = the correct elevation		685.228

2. *Sir* GEORGE SHUCKBURGH's *Method*.

I. Reduce the barometric heights to what they would be if they were of the temperature 32°. 271 and according to Shuckburgh.

II. The difference of the logarithms of the reduced barometrical heights will give the approximate elevation.

III. Correct the approximated elevation as before.

Same Example.

I. Mean expans. for 1° from Tab. A, is	0.000111
18°×0.000111×29.4= -	0.059
Subtract this from - -	29.4
Reduced barometric height -	29.341
Expans. from Tab. A is 0.000111.	
14°×0.000111×25.19 - -	0.039
Subtract from - -	25.190
Reduced barometric height -	25.151
II. Log. 29.341 - -	1.4674749
Log. 25.151 - -	1.4005553
Approximated elevation -	669.196
III. This multiplied by 1.0238 gives	685.125

Remark. 1. If 0.000101 be supposed the mean expansion of mercury for 1°, as Sir George Shuckburgh determines it, the reduction of the barometric heights will be had sufficiently exact by multiplying the observed heights of the mercury by the difference of its temperatures 272 Remarks on this method.

peratures from 32, and cutting off four more decimal places; thus $29.4\times\frac{18}{10000}$ gives the reduced height 29.347, and $25.19\times\frac{14}{10000}$ gives 25.155, and the difference of their logarithms gives 669.4 fathoms for the approximated elevation, which differs from the one given above by no more than 15 inches.

273 *Remark* 2. If 0.0024 be taken for the expansion of air for one degree, the correction for this expansion will be had by multiplying the approximated elevation by 12, and this product by the sum of the differences of the temperatures from 32°, counting the difference as negative when the temperature is below 32, and cutting off four places; thus $669.196\times12\times\overline{13+07}\times\frac{1}{10000}$ $=16.061$, which added to 669.196 gives 685.257, differing from the former only 9 inches.

274 An easy rule without the help of tables.

From the same premises we may derive a rule, which is abundantly exact for all geodætical purposes, and which requires no tables of any kind, and is easily remembered.

1. The height through which we must rise in order to produce any fall of the mercury in the barometer, is inversely proportional to the density of the air, that is, to the height of the mercury in the barometer.

2. When the barometer stands at 30 inches, and the air and quicksilver are of the temperature 32, we must rise through 87 feet, in order to produce a depression of $\frac{1}{10}$ of an inch.

3. But if the air be of a different temperature, this 87 feet must be increased or diminished by 0.21 of a foot for every degree of difference of the temperature from 32°.

4. Every degree of difference of the temperatures of the mercury at the two stations makes a change of 2.833 feet, or 2 feet 10 inches in the elevation.

Hence the following rule.

275 1. Take the difference of the barometric heights in tenths of an inch. Call this *d*.

2. Multiply the difference *a* between 32 and the mean temperature of the air by 21, and take the sum or difference of this product and 87 feet. This is the height through which we must rise to cause the barometer to fall from 30 inches to 29.9. Call this height *h*.

Let *m* be the mean between the two barometric heights. Then $\frac{30hd}{m}$ is the approximated elevation very nearly.

Multiply the difference ∂ of the mercurial temperatures by 2.83 feet, and add this product to the approximated elevation if the upper barometer has been the warmest, otherwise subtract it. The result, that is, the sum or difference, will be the corrected elevation.

Same Example.

$$d=294-251.9=42.1$$
$$b=87+10\times0.21,=89.1$$
$$m=\frac{29.4+25.19}{2}=27.29$$

Approx. elevation $=\frac{30\times42.1\times89.1}{27.29},=4123.24$ feet.

Corr. for temp. of mercury, $=4\times2.83$ — 11.32

Corrected elevation in feet - - 4111.92
Ditto in fathoms - - - - - 685.32

Differing from the former only 15 inches.

This rule may be expressed by the following simple and easily remembered formula, where *a* is the difference between 32° and the mean temperature of the air, *d* is the difference of barometric heights in tenths of an inch, *m* is the mean barometric height, ∂ the difference between the mercurial temperatures, and E is the correct elevation. $E=\frac{30(87\pm0.21a)d}{m}\pm\partial\times2.83$. 276

277 Heights of the most remarkable mountains.

We shall now conclude this subject by an account of some of the most remarkable mountains, &c. on the earth, above the surface of the ocean, in feet.

Mount Puy de Domme in Auvergne, the first mountain measured by the barometer		5088
Mount Blanc	Alps	15662
Monte Rosa	Alps	15084
Aiguille d'Argenture	Alps	13402
Monastery of St Bernard	Alps	7944
Mount Cenis		9212
Pic de los Reyes	Pyrenees	7620
Pic du Médi	Pyrenees	9300
Pic d'Offano	Pyrenees	11700
Canegou	Pyrenees	8544
Lake of Geneva		1232
Mount Ætna		10954
Mount Vesuvius		3938
Mount Hekla in Iceland		4887
Snowdown		3555
Ben More		3723
Ben Lawers		3858
Ben Gloe		3472
Schehallion		3461
Ben Lomond		3180
Tinto		2342
Table Hill, Cape of Good Hope		3454
Gondar city in Abyssinia		8440
Source of the Nile		8082
Pic of Teneriffe		14026
Chimboraço		19595
Cayambourow		19391
Antisana		19290
Pinchinha (see PERU, N° 56.)		15670
City of Quito (see ditto)		9977
Caspian sea below the ocean		306

This last is so singular, that it is necessary to give the authority on which this determination is founded. It is deduced from nine years observations with the barometer at Astrachan by Mr Lecre, compared with a series of observations made with the same barometer at St Petersburgh.

278 Improved barometers, with a description of Hooke's.

This employment of the barometer has caused it to become a very interesting instrument to the philosopher and to the traveller; and many attempts have been made of late to improve it, and render it more portable. The improvements have either been directed to the enlargement of its range, or to the more accurate measurement of its present scale. Of the first kind are Hooke's wheel barometer, the diagonal barometer, and the horizontal barometer, described in a former part of this

 work. See Barometer. In that place are alſo deſcribed two very ingenious contrivances of Mr Rownings, which are evidently not portable. Of all the barometers with an enlarged ſcale the beſt is that invented by Dr Hooke in 1668, and deſcribed in the Phil. Tranſ. N°185. The invention was alſo claimed by Huyghens and by De la Hire; but Hooke's was publiſhed long before.

Plate CCCCXXXX. fig. 73.

It conſiſts of a compound tube ABCDEFG (fig. 73.), of which the parts AB and DE are equally wide, and EFG as much narrower as we would amplify the ſcale. The parts AB and EG muſt alſo be as perfectly cylindrical as poſſible. The part HBCDI is filled with mercury, having a vacuum above in AB. IF is filled with a light fluid, and FG with another light fluid which will not mix with that in IF. The ciſtern G is of the ſame diameter as AB. It is eaſy to ſee that the range of the ſeparating ſurface at F muſt be as much greater than that of the ſurface I as the area of I is greater than that of F. And this ratio is in our choice. This barometer is free from all the bad qualities of thoſe formerly deſcribed, being moſt delicately moveable; and is by far the fitteſt for a chamber, for amuſement, by obſervations on the changes of the atmoſpheric preſſure. The ſlighteſt breeze cauſes it to riſe and fall, and it is continually in motion.

279 Inferior to the common one for the meaſurement of heights.

But this, and all other contrivances of the kind, are inferior to the common barometer for meaſurement of heights, on account of their bulk and cumberſomeneſs: nay, they are inferior for all philoſophical purpoſes in point of accuracy; and this for a reaſon that admits of no reply. Their ſcale muſt be determined in all its parts by the common barometer; and, therefore, notwithſtanding their great range, they are ſuſceptible of no greater accuracy than that with which the ſcale of a common barometer can be obſerved and meaſured. This will be evident to any perſon who will take the trouble to conſider how the points of their ſcale muſt be aſcertained. The moſt accurate method for graduating ſuch a barometer as we have now deſcribed would be to make a mixture of vitriolic acid and water, which ſhould have $\frac{1}{10}$ of the denſity of mercury. Then, let a long tube ſtand vertical in this fluid, and connect its upper end with the open end of the barometer by a pipe which has a branch to which we can apply the mouth. Then if we ſuck through this pipe, the fluid will riſe both in the barometer and in the other tube; and 10 inches riſe in this tube will correſpond to one inch deſcent in the common barometer. In this manner may every point of the ſcale be adjuſted in due proportion to the reſt. But it ſtill remains to determine what particular point of the ſcale correſponds to ſome determined inch of the common barometer. This can only be done by an actual compariſon; and this being done, the whole becomes equally accurate. Except therefore for the mere purpoſe of chamber amuſement, in which caſe the barometer laſt deſcribed has a decided preference, the common barometer is to be preferred; and our attention ſhould be entirely directed to its improvement and portability.

280 How the common one might be improved.

For this purpoſe it ſhould be furniſhed with two microſcopes or magnifying glaſſes, one of them ſtationed at the beginning of the ſcale; which ſhould either be moveable, ſo that it may always be brought to the ſurface of the mercury in the ciſtern, or the ciſtern ſhould be ſo contrived that its ſurface may always be brought to the beginning of the ſcale. The glaſs will enable us to ſee the coincidence with accuracy. The other microſcope muſt be moveable, ſo as to be ſet oppoſite to the ſurface of the mercury in the tube; and the ſcale ſhould be furniſhed with a vernier which divides an inch into 1000 parts, and be made of materials of which we know the expanſion with great preciſion.

For an account of many ingenious contrivances to make the inſtruments accurate, portable, and commodious, conſult Magellan, *Diſſer. de diverſes Inſtr. de Phyſ.*; *Phil. Tranſ.* lxvii. lxviii.; *Journ. de Phyſ.* xix. 108. 346. xvi. 392. xviii. 391. xxi. 436. xxii. 390.; Sulzer, *Act. Helvet.* iii. 259.; De Luc, *Recherches ſur les Modifications de l'Atmoſphere*, i. 401. ii. 459, 490. De Luc's ſeems the moſt ſimple and perfect of them all. Cardinal de Luynes (*Mem. Par.* 1768); Prinſ. De Luc, *Recherches*, § 63.; Van Swinden's *Poſitiones Phyſicæ*; *Com. Acad. Petrop.* i.; *Com. Acad. Petrop. Nov.* ii, 200 viii. 281

Thus we have given an elementary account of the diſtinguiſhing properties of air as a heavy and compreſſible fluid, and of the general phenomena which are immediate conſequences of theſe properties. This we have done in a ſet of propoſitions analogous to thoſe which form the doctrines of hydroſtatics. It remains to conſider it in another point of view, namely, as moveable and inert. The phenomena conſequent on theſe properties are exhibited in the velocities which air acquires by preſſure, in the reſiſtance which bodies meet with to their motion through the air, and in the impreſſion which air in motion gives to bodies expoſed to its action.

We ſhall firſt conſider the motions of which air is ſuſceptible when the equilibrium of preſſure (whether ariſing from its weight or its elaſticity) is removed; and in the next place, we ſhall conſider its action on ſolid bodies expoſed to its current, and the reſiſtance which it makes to their motion through it.

282 Doctrine of air in acceſſible ſituations as acted on by equal and parallel gravity.

In this conſideration we ſhall avoid the extreme of generality, which renders the diſcuſſion too abſtract and difficult, and adapt our inveſtigation to the circumſtances in which compreſſible fluids (of which air is taken for the repreſentative) are moſt commonly found. We ſhall conſider air therefore as it is commonly found in acceſſible ſituations, as acted on by equal and parallel gravity; and we ſhall conſider it in the ſame order in which water is treated in a ſyſtem of hydraulics.

283 analogous to the doctrine of water in hydraulics.

In that ſcience the leading problem is to determine with what velocity the water will move through a given orifice when impelled by ſome known preſſure; and it has been found, that the beſt form in which this moſt difficult and intricate propoſition can be put, is to determine the velocity of water flowing through this orifice when impelled by its weight alone. Having determined this, we can reduce to this caſe every queſtion which can be propoſed; for, in place of the preſſure of any piſton or other mover, we can always ſubſtitute a perpendicular column of water or air whoſe weight ſhall be equal to the given preſſure.

284 The velocity with which air ruſhes into a void by its own weight.

The firſt problem, therefore, is to determine with what velocity air will ruſh into a void when impelled by its weight alone. This is evidently analogous to the hydraulic problem of water flowing out of a veſſel.

And here we muſt be contented with referring our readers to the ſolutions which have been given of that problem,

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problem, and the demonſtration that it flows with the velocity which a heavy body would acquire by falling from a height equal to the depth of the hole under the ſurface of the water in the veſſel. In whatever way we attempt to demonſtrate that propoſition, every ſtep, nay, every word, of the demonſtration applies equally to the air, or to any fluid whatever. Or, if our readers ſhould wiſh to ſee the connection or analogy of the caſes, we only deſire them to recollect an undoubted maxim in the ſcience of motion, that *when the moving force and the matter to be moved vary in the ſame proportion, the velocity will be the ſame.* If therefore there be ſimilar veſſels of air, water, oil, or any other fluid, all of the height of a homogeneous atmoſphere, they will all run through equal and ſimilar holes with the ſame velocity; for in whatever proportion the quantity of matter moving through the hole be varied by a variation of denſity, the preſſure which forces it out, by acting in circumſtances perfectly ſimilar, varies in the ſame proportion by the ſame variation of denſity.

We muſt therefore aſſume it as the leading propoſition, that *air ruſhes from the atmoſphere into a void with the velocity which a heavy body would acquire by falling from the top of a homogeneous atmoſphere.*

It is known that air is about 840 times lighter than water, and that the preſſure of the atmoſphere ſupports water at the height of 33 feet nearly. The height therefore of a homogeneous atmoſphere is nearly 33×840, or 27720 feet. Moreover, to know the velocity acquired by any fall, recollect that a heavy body by falling one foot acquires the velocity of 8 feet per ſecond; and that the velocities acquired by falling through different heights are as the ſquare roots of the heights. Therefore to find the velocity correſponding to any height, expreſſed in feet per ſecond, multiply the ſquare root of the height by 8. We have therefore in the preſent inſtance $V = \sqrt{27220}, = 8 \times 166.493, = 1332$ feet per ſecond. This therefore is the velocity with which common air will ruſh into a void; and this may be taken as a ſtandard number in pneumatics, as 16 and 32 are ſtandard numbers in the general ſcience of mechanics, expreſſing the action of gravity at the ſurface of the earth.

It is eaſy to ſee that greater preciſion is not neceſſary in this matter. The height of a homogeneous atmoſphere is a variable thing, depending on the temperature of the air. If this reaſon ſeems any objection againſt the uſe of the number 1332, we may retain $8\sqrt{H}$ in place of it, where H expreſſes the height of a homogeneous atmoſphere of the given temperature. A variation of the barometer makes no change in the velocity, nor in the height of the homogeneous atmoſphere, becauſe it is accompanied by a proportional variation in the denſity of the air. When it is increaſed $\frac{1}{10}$, for inſtance, the denſity is alſo increaſed $\frac{1}{10}$; and thus the expelling force and the matter to be moved are changed in the ſame proportion, and the velocity remains the ſame. N. B. We do not here conſider the velocity which the air acquires after its iſſuing into the void by its continual expanſion. This may be aſcertained by the 39th prop. of Newton's *Principia*, b. i. Nay, which appears very paradoxical, if a cylinder of air, communicating in this manner with a void, be compreſſed by a piſton loaded with a weight, which preſſes it down as the air flows out, and thus keep it of the ſame denſity, the velocity of efflux will ſtill be the ſame, however great the preſſure may chance to be: for the firſt and immediate effect of the load on the piſton is to reduce the air in the cylinder to ſuch a denſity that its elaſticity ſhall exactly balance the load; and becauſe the elaſticity of air is proportional to its denſity, the denſity of the air will be increaſed in the ſame proportion with the load, that is, with the expelling power (for we are neglecting at preſent the weight of the included air as too inconſiderable to have any ſenſible effect). Therefore, ſince the matter to be moved is increaſed in the ſame proportion with the preſſure, the velocity will be the ſame as before.

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285 and the velocity with which it ruſhes into a ſpace containing rarer air.

It is equally eaſy to determine the velocity with which the air of the atmoſphere will ruſh into a ſpace containing rarer air. Whatever may be the denſity of this air, its elaſticity, which follows the proportion of its denſity, will balance a proportional part of the preſſure of the atmoſphere; and it is the exceſs of this laſt only which is the moving force. The matter to be moved is the ſame as before. Let D be the natural denſity of the air, and δ the denſity of the air contained in the veſſel into which it is ſuppoſed to run, and let P be the preſſure of the atmoſphere, and therefore equal to the force which impels it into a void; and let π be the force with which this rarer air would run into a void. We have $D : \delta = P : \pi$, and $\pi = \frac{P\delta}{D}$. Now the moving force in the preſent inſtance is $P - \pi$, or $P - \frac{P\delta}{D}$. Laſtly, let V be the velocity of air ruſhing into a void, and v the velocity with which it will ruſh into this rarefied air.

It is a theorem in the motion of fluids, that the preſſures are as the ſquares of the velocities of efflux. Therefore $P : P - \frac{P\delta}{D} = V^2 : v^2$. Hence we derive $v^2 = V^2 \times \overline{1 - \frac{\delta}{D}}$, and $v \times V = \sqrt{1 - \frac{\delta}{D}}$. We do not here conſider the reſiſtance which the air of the atmoſphere will meet with from the inertia of that in the veſſel which it muſt diſplace in its motion.

Here we ſee that there will always be a current into the veſſel while δ is leſs than D.

We alſo learn the gradual diminution of the velocity as the veſſel fills; for δ continually increaſes, and therefore $1 - \frac{\delta}{D}$ continually diminiſhes.

It remains to determine the time t expreſſed in ſeconds, in which the air of the atmoſphere will flow into this veſſel from its ſtate of vacuity till the air in the veſſel has acquired any propoſed denſity δ.

For this purpoſe let H, expreſſed in feet, be the height through which a heavy body muſt fall in order to acquire the velocity V, expreſſed alſo in feet per ſecond. This we ſhall expreſs more briefly in future, by calling it the height producing the velocity V. Let C repreſent the capacity of the veſſel, expreſſed in cubic feet, and O the area or ſection of the orifice, expreſſed in ſuperficial or ſquare feet; and let the natural denſity of the air be D.

Since the quantity of aerial matter contained in a veſſel depends on the capacity of the veſſel and the denſity of the air jointly, we may expreſs the air which would

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would fill this veſſel by the ſymbol CD when the air is in its ordinary ſtate, and by Cδ when it has the denſity δ. In order to obtain the rate at which it fills, we muſt take the fluxion of this quantity Cδ. This is C$\dot{\delta}$; for C is a conſtant quantity, and δ is a variable or flowing quantity.

But we alſo obtain the rate of influx by our knowledge of the velocity, and the area of the orifice, and the denſity. The velocity is V, or $8\sqrt{H}$, at the firſt inſtant; and when the air in the veſſel has acquired the denſity δ, that is, at the end of the time t, the velocity is $8\sqrt{H}\sqrt{1-\frac{\delta}{D}}$, or $8\sqrt{H}\sqrt{\frac{D-\delta}{D}}$,

or $8\sqrt{H}\frac{\sqrt{D-\delta}}{\sqrt{D}}$.

The rate of influx therefore (which may be conceived as meaſured by the little maſs of air which will enter during the time $\dot{t}$ with this velocity) will be $\frac{8\sqrt{HOD}\sqrt{D-\delta}\,\dot{t}}{\sqrt{D}}$, or $8\sqrt{HO}\sqrt{D}\sqrt{D-\delta}\,\dot{t}$, multiplying the velocity by the orifice and the denſity.

Here then we have two values of the rate of influx. By ſtating them as equal we have a fluxionary equation, from which we may obtain the fluents, that is, the time t in ſeconds neceſſary for bringing the air in the veſſel to the denſity δ, or the denſity δ which will be produced at the end of any time t. We have the equation $8\sqrt{HO}\sqrt{D}\sqrt{D-\delta}\,\dot{t}=C\dot{\delta}$. Hence we derive $\dot{t}=\frac{C}{8\sqrt{HO}\sqrt{D}}\times\frac{\dot{\delta}}{\sqrt{D-\delta}}$. Of this the fluent is $t=\frac{C}{4\sqrt{HO}\sqrt{D}}\times\sqrt{D-\delta}+A$, in which A is a conditional conſtant quantity. The condition which determines it is, that t muſt be nothing when δ is nothing, that is, when $\sqrt{D-\delta}=\sqrt{D}$; for this is evidently the caſe at the beginning of the motion. Hence it follows, that the conſtant quantity is $\sqrt{D}$, and the complete fluent, ſuited to the caſe, is

$$\frac{C}{4\sqrt{HO}\sqrt{D}}\times\overline{\sqrt{D}-\sqrt{D-\delta}}.$$

The motion ceaſes when the air in the veſſel has acquired the denſity of the external air; that is, when $\delta=D$, or when $t=\frac{C}{4\sqrt{HO}\sqrt{D}}\times\sqrt{D},=\frac{C}{4\sqrt{HO}}$. Therefore the time of completely filling the veſſel is $\frac{C}{4\sqrt{HO}}$.

286 Illuſtrated by examples in numbers.

Let us illuſtrate this by an example in numbers.

Suppoſing then that air is 840 times lighter than water, and the height of the homogeneous atmoſphere 27720 feet, we have $4\sqrt{H}=666$. Let us further ſuppoſe the veſſel to contain 8 cubic feet, which is nearly a wine hogſhead, and that the hole by which the air of the ordinary denſity, which we ſhall make =1, enters is an inch ſquare, or $\frac{1}{144}$ of a ſquare foot. Then the time in ſeconds of completely filling it will be $\frac{8'}{\frac{1}{144}666}$, or $\frac{1152''}{666}$, or 1.7297″. If the hole is only $\frac{1}{100}$ of a ſquare inch, that is, if its ſide is $\frac{1}{10}$ of an inch, the time of completely filling the hogſhead will be 173″ very nearly, or ſomething leſs than three minutes.

If we make the experiment with a hole cut in a thin plate, we ſhall find the time greater nearly in the proportion of 63 to 100, for reaſons obvious to all who have ſtudied hydraulics. In like manner we can tell the time neceſſary for bringing the air in the veſſel to $\frac{3}{4}$ of its ordinary denſity. The only variable part of our fluent is the coefficient $-\sqrt{D-\delta}$, or $\sqrt{1-\delta}$. Let δ be $=\frac{3}{4}$, then $\sqrt{1-\delta}=\sqrt{\frac{1}{4}}=\frac{1}{2}$, and $1-\sqrt{1-\delta}=\frac{1}{2}$; and the time is $86\frac{1}{2}''$ very nearly when the hole is $\frac{1}{10}$ of an inch wide.

Fig. 81.

287 The velocity of air with the additional impulſe of a weight moving down the veſſel.

Let us now ſuppoſe that the air in the veſſel ABCD (fig. 81.) is compreſſed by a weight acting on the cover AD, which is moveable down the veſſel, and is thus expelled into the external air.

The immediate effect of this external preſſure is to compreſs the air and give it another denſity. The denſity D of the external air correſponds to its preſſure P. Let the additional preſſure on the cover of the veſſel be p, and the denſity of the air in the veſſel be d. We ſhall have $P : P+p=D : d$; and therefore $p=P\times\frac{d-D}{D}$. Then, becauſe the preſſure which expels the air is the difference between the force which compreſſes the air in the veſſel and the force which compreſſes the external air, the expelling force is p. And becauſe the quantities of motion are as the forces which ſimilarly produce them, we ſhall have $P : P\times\frac{d-D}{D}=MV : mv$; where M and m expreſs the quantities of matter expelled, V expreſſes the velocity with which air ruſhes into a void, and v expreſſes the velocity ſought. But becauſe the quantities of aerial matter which iſſue from the ſame orifice in a moment are as the denſities and velocities jointly, we ſhall have $MV : mv=DVV : dvv,=DV^2 : dv^2$. Therefore $P : p\frac{d-D}{D}=DV^2 : dv$. Hence we deduce $v=V\sqrt{\frac{d-D}{d}}$.

We may have another expreſſion of the velocity without conſidering the denſity. We had $P : P+p=D : d$: therefore $d=\frac{D\times\overline{P+p}}{P}$, and $d-D=\frac{D\times\overline{P+p}}{P}-D$, $=\frac{D\times\overline{P+p}-DP}{P}$, and $\frac{d-D}{d}=\frac{D\times\overline{P+p}-DP}{D\times\overline{P+p}},=\frac{P+p-P}{P+p},=\frac{p}{P+p}$: therefore $v=V\times\sqrt{\frac{p}{P+p}}$, which is a very ſimple and convenient expreſſion.

288 The effect of the air's elaſticity conſidered.

Hitherto we have conſidered the motion of air as produced by its weight only. Let us now conſider the effect of its elaſticity.

Fig. 81.

Let ABCD (fig. 81.) be a veſſel containing air of any denſity D. This air is in a ſtate of compreſſion; and if the compreſſing force be removed it will expand, and its elaſticity will diminiſh along with its denſity. Its elaſticity in any ſtate is meaſured by the force which keeps it in that ſtate. The force which keeps common air in its ordinary denſity is the weight of the atmoſphere, and is the ſame with the weight of a column of water 33 feet high. If therefore we ſuppoſe that this air,

Air in Motion. air, instead of being confined by the top of the vessel, is pressed down by a moveable piston carrying a column of water 33 feet high, its elasticity will balance this pressure as it balances the pressure of the atmosphere; and as it is a fluid, and propagates through every part the pressure exerted on any one part, it will press on any little portion of the vessel by its elasticity in the same manner as when loaded with this column.

The consequence of this reasoning is, that if this small portion of the vessel be removed, and thus a passage be made into a void, the air will begin to flow out with the same velocity with which it would flow when impelled by its weight alone, or with the velocity acquired by falling from the top of a homogeneous atmosphere, or 1332 feet in a second nearly.

But as soon as some air has come out, the density of the remaining air is diminished, and its elasticity is diminished; therefore the expelling force is diminished. But the matter to be moved is diminished in the very same proportion, because the density and elasticity are found to vary according to the same law; therefore the velocity will continue the same from the beginning to the end of the efflux.

This may be seen in another way. Let P be the pressure of the atmosphere, which being the counterbalance and measure of the initial elasticity, is equal to the expelling force at the first instant. Let D be the initial density, and V the initial velocity. Let d be its density at the end of the time t of efflux, and v the contemporaneous velocity. It is plain that at the end of this time we shall have the expelling force $\pi = \frac{\mathrm{P}d}{\mathrm{D}}$; for $\mathrm{D} : d = \mathrm{P} : \pi \left(= \frac{\mathrm{P}d}{\mathrm{D}} \right)$.

These forces are proportional to the quantities of motion which they produce; and the quantities of motion are proportional to the quantities of matter M and m and the velocities V and v jointly: therefore we have $\mathrm{P} : \frac{\mathrm{P}d}{\mathrm{D}} = \mathrm{MV} : mv$. But the quantities of matter which escape through a given orifice are as the densities and velocities jointly; that is, $\mathrm{M} : m = \mathrm{DV} : dv$: therefore $\mathrm{P} : \frac{\mathrm{P}d}{\mathrm{D}} = \mathrm{DV}^2 : dv^2$, and $\mathrm{P} \times dv^2 = \frac{\mathrm{P}d\mathrm{DV}^2}{\mathrm{D}} = \mathrm{P}d\mathrm{V}^2$, and $\mathrm{V}^2 = v^2$, and $\mathrm{V} = v$, and the velocity of efflux is constant. Hence follows, what appears very unlikely at first sight, that however much the air in the vessel is condensed, it will always issue into a void with the same velocity.

289 Quantity of air issuing into a void in a given time, and the density at the end of that time. In order to find the quantity of aerial matter which will issue during any time t, and consequently the density of the remaining air at the end of this time, we must get the rate of efflux. In the element of time $\dot{t}$ there issues (by what has been said above) the bulk $8\sqrt{\mathrm{HO}}\,\dot{t}$ (for the velocity V is constant); and therefore the quantity $8\sqrt{\mathrm{HO}}\,d\dot{t}$. On the other hand, the quantity of air at the beginning was CD, C being the capacity of the vessel; and when the air has acquired the density d, the quantity is Cd, and the quantity run out is CD—Cd: therefore the quantity which has run out in the time t must be the fluxion of CD—Cd, or $-\mathrm{C}\dot{d}$. Therefore we have the equation $8\sqrt{\mathrm{HO}}\,d\dot{t} = -\mathrm{C}\dot{d}$, and $\dot{t} = \frac{-\mathrm{C}\dot{d}}{8\sqrt{\mathrm{HO}}\,d}$; $= \frac{\mathrm{C}}{8\sqrt{\mathrm{HO}}} \times -\frac{\dot{d}}{d}$. Air in Motion.

The fluent of this is $t = \frac{\mathrm{C}}{8\sqrt{\mathrm{HO}}} \log. d$. This fluent must be so taken that t may be $= o$ when $d = \mathrm{D}$. Therefore the correct fluent will be $t = \frac{\mathrm{C}}{8\sqrt{\mathrm{HO}}} \log. \frac{\mathrm{D}}{d}$, for $\log. \frac{\mathrm{D}}{\mathrm{D}} = \log. 1, = o$. We deduce from this, that it requires an infinite time for the whole air of a vessel to flow out of it into a void. N. B. By log. d, &c. is meant the hyperbolic logarithm of d, &c.

Let us next suppose that the vessel, instead of letting out its air into a void, emits it into air of a less density, which remains constant during the efflux, as we may suppose to be the case when a vessel containing condensed air emits it into the surrounding atmosphere. Let the initial density of the air in the vessel be δ, and that of the atmosphere D. Then it is plain that the expelling force is $\mathrm{P} - \frac{\mathrm{PD}}{\delta}$, and that after the time t it is $\frac{\mathrm{P}d}{\delta} - \frac{\mathrm{PD}}{\delta}$. We have therefore $\mathrm{P} - \frac{\mathrm{PD}}{\delta} : \frac{\mathrm{P}d}{\delta} - \frac{\mathrm{PD}}{\delta} = \mathrm{MV} : mv, = \delta\mathrm{V}^2 : dv^2$. Whence we derive $v = \mathrm{V}\sqrt{\frac{\delta\,\overline{d - \mathrm{D}}}{d\,\overline{\delta - \mathrm{D}}}}$. 290 When the vessel emits it into rarer air.

From this equation we learn that the motion will be at an end when $d = \mathrm{D}$: and if $\delta = \mathrm{D}$ there can be no efflux.

291 Relation between the time and density when issuing into a void. To find the relation between the time and the density, let H as before be the height producing the velocity V. The height producing the velocity of efflux v must be $\mathrm{H} \times \frac{\delta\,\overline{d - \mathrm{D}}}{d\,\overline{\delta - \mathrm{D}}}$, and the little parcel of air which will flow out in the time t will be $= 8\sqrt{\mathrm{HO}}\,d\dot{t}\sqrt{\frac{\delta\,\overline{d - \mathrm{D}}}{d\,\overline{\delta - \mathrm{D}}}}$. On the other hand, it is $= -\mathrm{C}\dot{d}$.

Hence we deduce the fluxionary equation $\dot{t} = \frac{\mathrm{C}\sqrt{\delta - \mathrm{D}}}{8\sqrt{\mathrm{HO}}\sqrt{\delta}} \times \frac{-\dot{d}}{\sqrt{d^2 - \mathrm{D}d}}$. The fluent of this, corrected so as to make $t = 0$ when $d = \delta$, is $t = \frac{\mathrm{C}\sqrt{\delta - \mathrm{D}}}{8\sqrt{\mathrm{HO}}\sqrt{\delta}} \times \log. \left(\frac{\delta - \frac{1}{2}\mathrm{D} + \sqrt{\delta^2 - \mathrm{D}\delta}}{d - \frac{1}{2}\mathrm{D} + \sqrt{d^2 - \mathrm{D}d}} \right)$. And the time of completing the efflux, when $d = \mathrm{D}$, is $t = \frac{\mathrm{C}\sqrt{\delta - \mathrm{D}}}{8\sqrt{\mathrm{HO}}\sqrt{\delta}} \times \log. \left(\frac{\delta - \frac{1}{2}\mathrm{D} + \sqrt{\delta^2 - \mathrm{D}\delta}}{\frac{1}{2}\mathrm{D}} \right)$.

Fig. 82. 292 When issuing from denser into rarer air. Lastly, let ABCD, CFGH (fig. 82.) be two vessels containing airs of different densities, and communicating by the orifice C, there will be a current from the vessel containing the denser air into that containing the rarer: suppose from ABCD into CFGH.

Let P be the elastic force of the air in ABCD, Q its density, and V its velocity, and D the density of the air in CFGH. And, after the time t, let the density of

of the air in ABCD be q, its veloſity v, and the denſity of the air in CFGH be δ. The expelling force from ABCD will be $P-\frac{PD}{Q}$ at the firſt inſtant, and at the end of the time t it will be $\frac{Pq}{Q}-\frac{P\delta}{Q}$. Therefore we ſhall have $P-\frac{PD}{Q}:\frac{Pq}{Q}-\frac{P\delta}{Q}=QV^2:qv^2$, which gives $v=V\times\sqrt{\frac{Q(q-\delta)}{q(Q-D)}}$, and the motion will ceaſe when $\delta=q$.

Let A be the capacity of the firſt veſſel, and B that of the ſecond. We have the ſecond equation $AQ+BD=Aq+B\delta$, and therefore $\delta=\frac{A(Q-q)+BD}{B}$. Subſtituting this value of δ in the former value of v, we have $v=\times\sqrt{\frac{Q[B(q-D)-A(Q-q)]}{qB(Q-D)}}$, which gives the relation between the velocity v and the denſity q.

In order to aſcertain the time when the air in ABCD has acquired the denſity q, it will be convenient to abridge the work by ſome ſubſtitutions. Therefore make $Q(B+A)=M$, $BQD+BQ^2=N$, $BQ-BD=R$ and $\frac{N}{M}=m$. Then, proceeding as before, we obtain the fluxionary equation $8\sqrt{HO}\,q\frac{\sqrt{Mq-N}}{\sqrt{R}\sqrt{q}}\dot{t}=\overline{AQ-A\dot{q}}=-A\dot{q}$, whence $\dot{t}=\frac{A\sqrt{R}}{8\sqrt{HO}\sqrt{M}}\times\frac{\dot{q}}{\sqrt{q^2-mq}}$ of which the fluent, completed ſo that $t=o$ when $q=Q$, is $t=\frac{A\sqrt{R}}{8\sqrt{HO}\sqrt{M}}\times\log.\left(\frac{Q-\frac{1}{2}m+\sqrt{(Q^2mQ)}}{q-\frac{1}{2}m+\sqrt{(q^2mq)}}\right)$.

293 When air is expelled by force, as in bellows.

Some of theſe queſtions are of difficult ſolution, and they are not of frequent uſe in the more important and uſual applications of the doctrines of pneumatics, at leaſt in their preſent form. The caſes of greateſt uſe are when the air is expelled from a veſſel by an external force, as when bellows are worked, whether of the ordinary form or conſiſting of a cylinder fitted with a moveable piſton. This laſt caſe merits a particular conſideration; and, fortunately, the inveſtigation is extremely eaſy.

Fig. 81.

Let AD, fig. 81. be conſidered as a piſton moving downward with the uniform velocity f, and let the area of the piſton be n times the area of the hole of efflux, then the velocity of efflux ariſing from the motion of the piſton will be nf. Add this to the velocity V produced by the elaſticity of the air in the firſt queſtion, and the whole velocity will be $V+nf$. It will be the ſame in the other. The problem is alſo freed from the conſideration of the time of efflux. For this depends now on the velocity of the piſton. It is ſtill, however, a very intricate problem to aſcertain the relation between the time and the denſity, even though the piſton is moving uniformly; for at the beginning of the motion the air is of common denſity. As the piſton deſcends, it both expels and compreſſes the air, and the denſity of the air in the veſſel varies in a very intricate manner, as alſo its reſiſtance or reaction on the piſton. For this reaſon, a piſton which moves uniformly by means of an external force will never make an uniform blaſt by ſucceſſive ſtrokes; it will always be weaker at the beginning of the ſtroke. The beſt way for ſecuring an uniform blaſt is to employ the external force only for lifting up the piſton, and then to let the piſton deſcend by its own weight. In this way it will quickly ſink down, compreſſing the air, till its denſity and correſponding elaſticity exactly balance the weight of the piſton. After this the piſton will deſcend equably, and the blaſt will be uniform. We ſhall have occaſion to conſider this more particularly under the head of *PNEUMATICAL Machines*. Theſe obſervations and theorems will ſerve to determine the initial velocity of the air in all important caſes of its expulſion. The philoſopher will learn the rate of its efflux out of one veſſel into another; the chemiſt will be able to calculate the quantities of the different gaſes which are employed in the curious experiments of the ingenious but unfortunate Lavoiſier on Combuſtion, and will find them extremely different from what he ſuppoſed; the engineer will learn how to proportion the motive force of his machine to the quantity of aerial matter which his bellows muſt ſupply. But it is not enough, for this purpoſe, that the air *begin* to iſſue in the proper quantity; we muſt ſee whether it be not affected by the circumſtances of its ſubſequent paſſage.

294 Paſſage of air through pipes, &c. ſimilar to the motion of water in conduits.

All the modifications of motion which are obſerved in water conduits take place alſo in the paſſage of air through pipes and holes of all kinds. There is the ſame diminution of quantity paſſing through a hole in a thin plate that is obſerved in water. We know that (abating the ſmall effect of friction) water iſſues with the velocity acquired by falling from the ſurface; and yet if we calculate by this velocity and by the area of the orifice, we ſhall find the quantity of water deficient nearly in the proportion of 63 to 100. This is owing to the water preſſing towards the orifice from all ſides, which occaſions a contraction of the jet. The ſame thing happens in the efflux of air. Alſo the motion of water is greatly impeded by all contractions of its paſſage. Theſe oblige it to accelerate its velocity, and therefore require an increaſe of preſſure to force it through them, and this in proportion to the ſquares of the velocities. Thus, if a machine working a pump cauſes it to give a certain number of ſtrokes in a minute, it will deliver a determined quantity of water in that time. Should it happen that the paſſage of the water is contracted to one half in any part of the machine (a thing which frequently happens at the valves), the water muſt move through this contraction with twice the velocity that it has in the reſt of the paſſage. This will require four times the force to be exerted on the piſton. Nay (which will appear very odd, and is never ſuſpected by engineers), if no part of the paſſage is narrower than the barrel of the pump, but on the contrary a part much wider, and if the conduit be again contracted to the width of the barrel, an additional force muſt be applied to the piſton to drive the water through this paſſage, which would not have been neceſſary if the paſſage had not been widened in any part. It will require a force equal to the weight of a column of water of the height neceſſary for communicating a velocity, the ſquare of which is equal to the difference of the ſquares of the velocities of the water in the wide and the narrow part of the conduit.

Air in Motion.

The fame thing takes place in the motion of air, and therefore all contractions and dilatations muft be carefully avoided, when we want to preferve the velocity unimpaired.

295 Air fuffers the fame retardation along pipes as water, and the neceffity of attending to this.

Air alfo fuffers the fame retardation in its motion along pipes. By not knowing, or not attending to that, engineers of the firft reputation have been prodigioufly difappointed in their expectations of the quantity of air which will be delivered by long pipes. Its extreme mobility and lightnefs hindered them from fufpecting that it would fuffer any fenfible retardation. Dr Papin, a moft ingenious man, propofed this as the moft effectual method of transferring the action of a moving power to a great diftance. Suppofe, for inftance, that it was required to raife water out of a mine by a water-machine, and that there was no fall of water nearer than a mile's diftance. He employed this water to drive a pifton, which fhould comprefs the air in a cylinder communicating, by a long pipe, with another cylinder at the mouth of the mine. This fecond cylinder had a pifton in it, whofe rod was to give motion to the pumps at the mine. He expected, that as foon as the pifton at the water-machine had compreffed the air fufficiently, it would caufe the air in the cylinder at the mine to force up its pifton, and thus work the pumps. Dr Hooke made many objections to the method, when laid before the Royal Society, and it was much debated there. But dynamics was at this time an infant fcience, and very little underftood. Newton had not then taken any part in the bufinefs of the fociety, otherwife the true objections would not have efcaped his fagacious mind. Notwithftanding Papin's great reputation as an engineer and mechanic, he could not bring his fcheme into ufe in England; but afterwards, in France and in Germany, where he fettled, he got fome perfons of great fortunes to employ him in this project; and he erected great machines in Auvergne and Weftphalia for draining mines. But, fo far from being effective machines, they would not even begin to move. He attributed the failure to the quantity of air in the pipe of communication, which muft be condenfed before it can condenfe the air in the remote cylinder. This indeed is true, and he fhould have thought of this earlier. He therefore diminifhed the fize of this pipe, and made his water-machine exhauft inftead of condenfing, and had no doubt but that the immenfe velocity with which air rufhes into a void would make a rapid and effectual communication of power. But he was equally difappointed here, and the machine at the mine ftood ftill as before.

Near a century after this, a very intelligent engineer attempted a much more feafible thing of this kind at an iron-foundery in Wales. He erected a machine at a powerful fall of water, which worked a fet of cylinder bellows, the blowpipe of which was conducted to the diftance of a mile and a half, where it was applied to a blaft furnace. But notwithftanding every care to make the conducting pipe very air-tight, of great fize, and as fmooth as poffible, it would hardly blow out a candle. The failure was afcribed to the impoffibility of making the pipe air-tight. But, what was furprifing, above ten minutes elapfed after the action of the piftons in the bellows before the leaft wind could be perceived at the end of the pipe; whereas the engineer expected an interval of 6 feconds only.

[295] No diftinct theory on this fubject.

No very diftinct theory can be delivered on this fubject; but we may derive confiderable affiftance in underftanding the caufes of the obftruction to the motion of water in long pipes, by confidering what happens to air. The elafticity of the air, and its great compreffibility, have given us the diftincteft notions of fluidity in general, fhowing us, in a way that can hardly be controverted, that the particles of a fluid are kept at a diftance from each other, and from other bodies, by the corpufcular forces. We fhall therefore take this opportunity to give a view of the fubject, which did not occur to us when treating of the motion of water in pipes, referving a further difcuffion to the articles River, *Water-Works*.

296 How fluids are obftructed in moving along canals.

The writers on hydrodynamics have always confidered the obftruction to the motion of fluids along canals of any kind, as owing to fomething like the friction by which the motion of folid bodies on each other is obftructed; but we cannot form to ourfelves any diftinct notion of refemblance, or even analogy between them. The fact is, however, that a fluid running along a canal has its motion obftructed; and that this obftruction is greateft in the immediate vicinity of the folid canal, and gradually diminifhes to the middle of the ftream. It appears, therefore, that the parts of fluids can no more move among each other than among folid bodies, without fuffering a diminution of their motion. The parts in phyfical contact with the fides and bottom are retarded by thefe immoveable bodies. The particles of the next ftratum of fluid cannot preferve their initial velocities without overpaffing the particles of the firft ftratum; and it appears from the fact that they are by this means retarded. They retard in the fame manner the particles of the third ftratum, and fo on to the middle ftratum or thread of fluid. It appears from the fact, therefore, that this fort of friction is not a confequence of rigidity alone, but that it is equally competent to fluids. Nay, fince it is a matter of fact in air, and is even more remarkable there than in any other fluid, as we fhall fee by the experiments which have been made on the fubject; and as our experiments on the compreffion of air fhow us the particles of air ten times nearer to each other in fome cafes than in others (viz. when we fee air a thoufand times denfer in thefe cafes), and therefore force us to acknowledge that they are not in contact; it is plain that this obftruction has no analogy to friction, which fuppofes roughnefs or inequality of furface. No fuch inequality can be fuppofed in the furface of an aerial particle; nor would it be of any fervice in explaining the obftruction, fince the particles do not rub on each other, but pafs each other at fome fmall and imperceptible diftance.

We muft therefore have recourfe to fome other mode of explication. We fhall apply this to air only in this place; and, fince it is proved by the incontrovertible experiments of Canton, Zimmerman, and others, that water, mercury, oil, &c. are alfo compreffible and perfectly elaftic, the argument from this principle, which is conclufive in air, muft equally explain the fimilar phenomenon in hydraulics.

The moft highly polifhed body which we know muft be conceived as having an uneven furface when we compare it with the fmall fpaces in which the corpufcular forces are exerted; and a quantity of air moving in

in a polished pipe may be compared to a quantity of small shot sliding down a channel with undulated sides and bottom. The row of particles immediately contiguous to the sides will therefore have an undulated motion: but this undulation of the contiguous particles of air will not be so great as that of the surface along which they glide; for not only every motion requires force to produce it, but also every change of motion. The particles of air resist this change from a rectilineal to an undulating motion; and, being elastic, that is, repelling each other and other bodies, they keep a little nearer to the surface as they are passing over an eminence, and their path is less incurvated than the surface. The difference between the motion of the particles of air and the particles of a fluid quite unelastic is, in this respect, somewhat like the difference between the motion of a spring-carriage and that of a common carriage. When the common carriage passes along a road not perfectly smooth, the line described by the centre of gravity of the carriage keeps perfectly parallel to that described by the axis of the wheels, rising and falling along with it. Now let a spring body be put on the same wheels and pass along the same road. When the axis rises over an eminence perhaps half an inch, sinks down again into the next hollow, and then rises a second time, and so on, the centre of gravity of the body describes a much straighter line; for upon the rising of the wheels, the body resists the motion, and compresses the springs, and thus remains lower than it would have been had the springs not been interposed. In like manner, it does not sink so low as the axle does when the wheels go into a hollow. And thus the motion of spring-carriages becomes less violently undulated than the road along which they pass. This illustration will, we hope, enable the reader to conceive how the deviation of the particles next to the sides and bottom, of the canal from a rectilineal motion is less than that of the canal itself.

297 Particles of air resist a change from a rectilineal to an undulating motion,

298 and the undulation of the second row of particles will be less than that of the first. Fig. 83.

It is evident that the same reasoning will prove that the undulation of the next row of particles will be less than that of the first, that the undulation of the third row will be less than that of the second, and so on, as is represented in fig. 83. And thus it appears, that while the mass of air has a progressive motion along the pipe or canal, each particle is describing a waving line, of which a line parallel to the direction of the canal is the axis, cutting all these undulations. This axis of each undulated path will be straight or curved as the canal is, and the excursions of the path on each side of its axis will be less and less as the axis of the path is nearer to the axis of the canal.

299 Each particle appears to lose no velocity.

Let us now see what *sensible* effect this will have; for all the motion which we here speak of is imperceptible. It is demonstrated in mechanics, that if a body moving with any velocity be deflected from its rectilineal path by a curved and perfectly smooth channel, to which the rectilineal path is a tangent, it will proceed along this channel with undiminished velocity. Now the path, in the present case, may be considered as perfectly smooth, since the particles do not touch it. It is one of the undulations which we are considering, and we may at present conceive this as without any subordinate inequalities. There should not, therefore, be any diminution of the velocity. Let us grant this of the absolute velocity of the particle; but what we observe is the velocity of the mass, and we judge of it perhaps by the motion of a feather carried along by it. Let us suppose a single atom to be a sensible object, and let us attend to two such particles, one at the side, and the other in the middle: although we cannot perceive the undulations of these particles during their progressive motions, we see the progressive motions themselves. Let us suppose then that the middle particle has moved without any undulation whatever, and that it has advanced ten feet. The lateral particle will also have moved ten feet; but this has not been in a straight line. It will not be so far advanced, therefore, in the direction of the canal; it will be left behind, and will appear to us to have been retarded in its motion: and in like manner each thread of particles will be more and more retarded (apparently only) as it recedes farther from the axis of the canal, or what is usually called the thread of the stream.

300 But on the whole the undulatory motion is a real obstruction.

And thus the observed fact is shown to be a necessary consequence of what we know to be the nature of a compressible or elastic fluid; and that without supposing any diminution in the real velocity of each particle, there will be a diminution of the velocity of the sensible threads of the general stream, and a diminution of the whole quantity of air which passes along it during a given time.

Let us now suppose a parcel of air impelled along a pipe, which is *perfectly* smooth, out of a larger vessel, and issuing from this pipe with a certain velocity. It requires a certain force to change its velocity in the vessel to the greater velocity which it has in the pipe. This is abundantly demonstrated. How long soever we suppose this pipe, there will be no change in the velocity, or in the force to keep it up. But let us suppose that about the middle of this pipe there is a part of it which has suddenly got an undulated surface, however imperceptible. Let us further suppose that the final velocity of the middle thread is the same as before. In this case it is evident that the sum total of the motions of all the particles is greater than before, because the absolute motions of the lateral particles is greater than that of the central particle, which we suppose the same as before. This absolute increase of motion cannot be without an increase of propelling force: the force acting now, therefore, must be greater than the force acting formerly. Therefore, if only the former force had continued to act, the same motion of the central particle could not have been preserved, or the progressive motion of the whole stream must be diminished.

And thus we see that this internal insensible undulatory motion becomes a real obstruction to the sensible motion which we observe, and occasions an expence of power.

301 An additional force necessary for preserving a given progressive motion,

Let us see what will be the consequence of extending this obstructing surface further along the canal. It must evidently be accompanied by an augmentation of the motion produced, if the central velocity be still kept up; for the particles which are now in contact with the sides do not continue to occupy that situation; the middle particles moving faster *forward* get over them, and in their turn come next the side; and as they are really moving equally fast, but not in the direction into which they are now to be forced, force is necessary for changing the direction also; and this is in addition

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addition to the force neceſſary for producing the undulations ſo minutely treated of. The conſequence of this muſt be, that an additional force will be neceſſary for preſerving a given progreſſive motion in a longer *obſtructing* pipe, and that the motion produced in a pipe of greater length by a given force will be leſs than in a ſhorter one, and the efflux will be diminiſhed.

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eſpecially through any contraction.

There is another conſideration which muſt have an influence here. Nothing is more irrefragably demonſtrated than the neceſſity of an additional force for producing an efflux through any contraction, even though it ſhould be ſucceeded by a dilatation of the paſſage. Now both the inequalities of the ſides and the undulations of the motions of each particle are equivalent to a ſucceſſion of contractions and dilatations; although each of theſe is next to infinitely ſmall; their number is alſo next to infinitely great, and therefore the total effect may be ſenſible.

303
There are beſides other obſtructions, as angular aſperities, &c.

We have hitherto ſuppoſed that the abſolute velocity of the particles was not diminiſhed; this we did, having aſſumed that the interval of each undulation of the ſides was without inequalities. But this was gratuitous: it was alſo gratuitous that the ſides were only undulated. We have no reaſon for excluding angular aſperities. Theſe will produce, and moſt certainly often produce, real diminutions in the velocity of the contiguous particles; and this muſt extend to the very axis of the canal, and produce a diminution of the ſum total of motion: and in order to preſerve the ſame ſenſible progreſſive motion, a greater force muſt be employed. This is all that can be meant by ſaying that there is a reſiſtance to the motion of air through long pipes.

304
and a want of perfect fluidity.

There remains another cauſe of diminution, viz. the want of perfect fluidity, whether ariſing from the diſſemination of ſolid particles in a real fluid, or from the viſcidity of the fluid. We ſhall not inſiſt on this at preſent, becauſe it cannot be ſhown to obtain in air, at leaſt in any caſe which deſerves conſideration. It ſeems of no importance to determine the motion of air hurrying along with it ſoot or duſt. The effect of fogs on a particular modification of the motion of air has been conſidered under Acoustics. What has been ſaid on this ſubject is ſufficient for our purpoſe, as explaining the prodigious and unexpected obſtruction to the paſſage of air through long and narrow pipes. We are able to collect an important maxim from it, viz. that all pipes of communication ſhould be made as wide as circumſtances will permit; for it is plain that the obſtruction depends on the internal ſurface, and the force to overcome it muſt be in proportion to the maſs of matter which is in motion. The firſt increaſes as the diameter of the pipe, and the laſt as the ſquare. The obſtruction muſt therefore bear a greater proportion to the whole motion in a ſmall pipe than in a large one.

305
The law of retardation extending from the axis to the ſides of the canal unknown.

It were very deſirable to know the law by which the retardation extends from the axis to the ſides of the canal, and the proportion which ſubſiſts between the lengths of the canal and the forces neceſſary for overcoming the obſtructions when the velocity is given; as alſo whether the proportion of the obſtruction to the whole motion varies with the velocity: but all this is unknown. It does not, however, ſeem a deſperate caſe in air: we know pretty diſtinctly the law of action among its particles, viz. that their mutual repulſions are inverſely as their diſtances. This promiſes to enable us to trace the progreſs of undulation from the ſides of the canal to the axis.

306
It will not increaſe ſo faſt as the ſquare of the velocities.

We can ſee that the retardations will not increaſe ſo faſt as the ſquare of the velocity. Were the fluid incompreſſible, ſo that the undulatory path of a particle were invariable, the deflecting forces by which each individual particle is made to deſcribe its undulating path would be preciſely ſuch as ariſe from the path itſelf and the motion in it; for each particle would be in the ſituation of a body moving along a fixed path. But in a very compreſſible fluid, ſuch as air, each particle may be conſidered as a ſolitary body, actuated by a projectile and a tranſverſe force, ariſing from the action of the adjoining particles. Its motion muſt depend on the adjuſtment of theſe forces, in the ſame manner as the elliptical motion of a planet depends on the adjuſtment of the force of projection, with a gravitation inverſely proportional to the ſquare of the diſtance from the focus. The tranſverſe force in the preſent caſe has its origin in the preſſure on the air which is propelling it along the pipe: this, by ſqueezing the particles together, brings their mutual repulſion into action. Now it is the property of a perfect fluid, that a preſſure exerted on any part of it is propagated equally through the whole fluid; therefore the tranſverſe forces which are excited by this preſſure are proportional to the preſſure itſelf; and we know that the preſſures exerted on the ſurface of a fluid, ſo as to expel it through any orifice, or along any canal, are proportional to the ſquares of the velocities which they produce. Therefore, in every point of the undulatory motion of any particle, the tranſverſe force by which it is deflected into a curve is proportional to the ſquare of its velocity. When this is the caſe, a body would continue to deſcribe the ſame curve as before; but by the very compreſſion, the curvatures are increaſed, ſuppoſing them to remain ſimilar. This would require an increaſe of the tranſverſe forces; but this is not to be found: therefore the particle will not deſcribe a ſimilar curve, but one which is leſs incurvated in all its parts; conſequently the progreſſive velocity of the whole, which is the only thing perceivable by us, will not be ſo much diminiſhed; that is, the obſtructions will not increaſe ſo faſt as they would otherwiſe do, or as the ſquares of the velocities.

This reaſoning is equally applicable to all fluids, and is abundantly confirmed by experiments in hydraulics, as we ſhall ſee when conſidering the motion of rivers. We have taken this opportunity of delivering our notions on this ſubject; becauſe, as we have often ſaid, it is in the avowed diſcrete conſtitution of air that we ſee moſt diſtinctly the operation of thoſe natural powers which conſtitute fluidity in general.

307
M. Boſſut's experiments on pipes and canals.

We would beg leave to mention a form of experiment for diſcovering the law of retardation with conſiderable accuracy. Experiments have been made on pipes and canals. Mr Boſſut, in his *Hydrodynamique*, has given a very beautiful ſet made on pipes of an inch and two inches diameter, and 200 feet long: but although theſe experiments are very inſtructive, they do not give us any rule by which we can extend the reſult to pipes of greater length and different diameters.

Let a ſmooth cylinder be ſet upright in a very large veſſel or pond, and be moveable round its axis: let it be turned round by means of a wheel and pulley with an uniform

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uniform motion and determined velocity. It will exert the ſame force on the contiguous water which would be exerted on it by water turning round it with the ſame velocity: and as this water would have its motion gradually retarded by the fixed cylinder, ſo the moving cylinder will gradually communicate motion to the ſurrounding water. We ſhould obſerve the water gradually dragged round by it; and the vortex would extend farther and farther from it as the motion is continued, and the velocities of the parts of the vortex will be leſs and leſs as we recede from the axis. Now, we apprehend, that when a point of the ſurface of the cylinder has moved over 200 feet, the *motion* of the water at different diſtances from it will be ſimilar and proportional to, if not preciſely the ſame with, the *retardations* of water flowing 200 feet at the ſame diſtance from the ſide of a canal: at any rate, the two are ſuſceptible of an accurate compariſon, and the law of retardation may be accurately deduced from obſervations made on the motions of this vortex.

308 Wind is air in motion.

Air in motion is a very familiar object of obſervation; and it is intereſting. In all languages it has got a name; we call it wind: and it is only upon reflection that we conſider air as wind in a quieſcent ſtate. Many perſons hardly know what is meant when air is mentioned; but they cannot refuſe that the blaſt from a bellows is the expulſion of what they contained; and thus they learn that wind is air in motion.

309 The velocity of wind not eaſily diſcovered.

It is of conſequence to know the velocity of wind; but no good and unexceptionable method has been contrived for this purpoſe. The beſt ſeems to be by meaſuring the ſpace paſſed over by the ſhadow of a cloud; but this is extremely fallacious. In the firſt place, it is certain, that although we ſuppoſe that the cloud has the velocity of the air in which it is carried along, this is not an exact meaſure of the current on the ſurface of the earth; we may be almoſt certain that it is greater: for air, like all other fluids, is retarded by the ſides and bottom of the channel in which it moves. But, in the next place, it is very gratuitous to ſuppoſe, that the velocity of the cloud is the velocity of the ſtratum of air between the cloud and the earth; we are almoſt certain that it is not. It is abundantly proved by Dr Hutton of Edinburgh, that clouds are always formed when two parcels of air of different temperatures mix together, each containing a proper quantity of vapour in the ſtate of chemical ſolution. We know that different ſtrata of air will frequently flow in different directions for a long time. In 1781 while a great fleet rendezvouzed in Leith Roads during the Dutch war, there was a briſk eaſterly wind for about five weeks; and, during the laſt fortnight of this period, there was a briſk weſterly current at the height of about three-fourths of a mile. This was diſtinctly indicated by frequent fleecy clouds at a great diſtance above a lower ſtratum of theſe clouds, which were driving all this time from the eaſtward. A gentleman who was at the ſiege of Quebec in 1759, informed us, that one day while there blew a gale from the weſt, ſo hard that the ſhips at anchor in the river were obliged to ſtrike their topmaſts, and it was with the utmoſt difficulty that ſome well-manned boats could row againſt it, carrying ſome artillery ſtores to a poſt above the town, ſeveral ſhells were thrown from the town to deſtroy the boats: one of the ſhells burſt in the air near the top of its flight, which was about half a mile high. The ſmoke of this bomb remained in the ſame ſpot for above a quarter of an hour, like a great round ball, and gradually diſſipated by diffuſion, without removing many yards from its place. When, therefore, two ſtrata of air come from different quarters, and one of them flows over the other, it will be only in the contiguous ſurfaces that a precipitation of vapour will be made. This will form a thin fleecy cloud; and it will have a velocity and direction which neither belongs to the upper nor to the lower ſtratum of air which produced it. Should one of theſe ſtrata come from the eaſt and the other from the weſt with equal velocities, the cloud formed between them will have no motion at all; ſhould one come from the eaſt, and the other from the north, the cloud will move from the north-eaſt with a greater velocity than either of the ſtrata. So uncertain then is the information given by the clouds either of the velocity or the direction of the wind. A thick ſmoke from a furnace will give us a much leſs equivocal meaſure; and this, combined with the effects of the wind in impelling bodies, or deflecting a loaded plane from the perpendicular, or other effects of this kind, may give us meaſures of the different currents of wind with a preciſion ſufficient for all practical uſes.

310 The reſult of Smeaton's obſervation on this head.

The celebrated engineer Mr John Smeaton has given, in the 51ſt volume of the Philoſophical Tranſactions, the velocities of wind correſponding to the uſual denominations in our language. Theſe are founded on a great number of obſervations made by himſelf in the courſe of his practice in erecting wind-mills. They are contained in the following table.

Miles per hour.	Feet per ſecond.	Names.
1	1.47	
2	2.93	Light airs.
3	4.40	
4	5.87	Breeze.
5	7.33	
10	14.67	Briſk gale.
15	22.	
20	29.34	Freſh gale.
25	36.67	
30	44.01	Strong gale.
35	51.34	
40	58.68	Hard gale.
45	66.01	
50	73.35	Storm.
60	88.02	
80	117.36	Hurricane, tearing up trees, overturning buildings, &c.
100	146.70	

See alſo ſome valuable experiments by him on this ſubject, Philoſophical Tranſactions 1760 and 1761.

311 Account of Dr Lind's anemometer.

One of the moſt ingenious and convenient methods for meaſuring the velocity of the wind is to employ its preſſure in ſupporting a column of water, in the ſame way as Mr Pitot meaſures the velocity of a current of water. We believe that it was firſt propoſed by Dr James Lind of Windſor, a gentleman eminent for his great knowledge in all the branches of natural ſcience, and for his ingenuity in every matter of experiment or practical application.

His anemometer (as theſe inſtruments are called) conſiſts Fig. 84.

Velocity of Wind. fists of a glass tube of the form ABCD (fig. 84.), open at both ends, and having the branch AB at right angles to the branch CD. This tube contains a few inches of water or any fluid (the lighter the better); it is held with the part CD upright, and AB horizontal and in the direction of the wind; that is, with the mouth A fronting the wind. The wind acts in the way of pressure on the air in AB, compresses it, and causes it to press on the surface of the liquor; forcing it down to F, while it rises to E in the other leg. The velocity of the wind is concluded from the difference E*f* between the heights of the liquor in the legs. As the wind does not generally blow with uniform velocity, the liquor is apt to dance in the tube, and render the observation difficult and uncertain: to remedy this, it is proper to contract very much the communication at C between the two legs. If the tube has half an inch of diameter (and it should not have less), a hole of $\frac{1}{10}$ of an inch is large enough; indeed the hole can hardly be too small, nor the tubes too large.

312 It is ingenious and useful. This instrument is extremely ingenious, and will undoubtedly give the proportions of the velocities of different currents with the greatest precision; for in whatever way the pressure of wind is produced by its motion, we are certain that the different pressures are as the squares of the velocities: if, therefore, we can obtain one certain measure of the velocity of the wind, and observe the degree to which the pressure produced by it raises the liquor, we can at all other times observe the pressures and compute the velocities from them, making proper allowances for the temperature and the height of the mercury in the barometer; because the velocity will be in the subduplicate ratio of the density of the air inversely when the pressure is the same.

It is usually concluded, that the velocity of the wind is that which would be acquired by falling from a height which is to E*f* as the weight of water is to that of an equal bulk of air. Thus, supposing air to be 840 times lighter than water, and that E*f* is $\frac{6}{10}$ of an inch, the velocity will be about 63 feet per second, which is that of a very hard gale, approaching to a storm. Hence we see by the bye, that the scale of this instrument is extremely short, and that it would be a great improvement of it to make the leg CD not perpendicular, but very much sloping; or perhaps the following form of the instrument will give it all the perfection of which it is

Fig. 85. capable. Let the horizontal branch AB (fig. 85.) be contracted at B, and continued horizontally for several inches BG of a much smaller bore, and then turned down for two or three inches GC, and then upwards with a wide bore. To use this instrument, hold it with the part DC perpendicular; and (having sheltered the mouth A from the wind) pour in water at D till it advances along GB to the point B, which is made the beginning of the scale; the water in the upright branch standing at *f* in the same horizontal line with BG. Now, turn the mouth A to the wind; the air in AB will be compressed and will force the water along BG to F, and cause it to rise from *f* to E; and the range *f*E will be to the range BF on the scale as the section of the tube BG to that of CD. Thus, if the width of DC be $\frac{1}{2}$ an inch, and that of BG $\frac{1}{10}$, we shall have 25 inches in the scale for one inch of real pressure E*f*.

But it has not been demonstrated in a very satisfactory manner, that the velocity of the wind is that acquired by falling through the height of a column of air whose weight is equal to that of the column of water E*f*. Experiments made with Pitot's tube in currents of water show that several corrections are necessary for concluding the velocity of the current from the elevations in the tube: these corrections may however be made, and safely applied to the present case; and then the instrument will enable us to conclude the velocity of the wind immediately, without any fundamental comparison of the elevation, with a velocity actually determined upon other principles. The chief use which we have for this information is in our employment of wind as an impelling power, by which we can actuate machinery or navigate ships. These are very important applications of pneumatical doctrines, and merit a particular consideration; and this naturally brings us to the last part of our subject, viz. the consideration of the impulse of air on bodies exposed to its action, and the resistance which it opposes to the passage of bodies through it.

313 This subject is most important, but it is also difficult. This is a subject of the greatest importance; being the foundation of that art which has done the greatest honour to the ingenuity of man, and the greatest service to human society, by connecting together the most distant inhabitants of this globe, and making a communication of benefits which would otherwise have been impossible; we mean the art of Navigation or Seamanship. Of all the machines which human art has constructed, a ship is not only the greatest and most magnificent, but also the most ingenious and intricate; and the clever seaman possesses a knowledge founded on the most difficult and abstruse doctrines of mechanics. The seaman probably cannot give any account of his own science; and he possesses it rather by a kind of intuition than by any process of reasoning; but the success and efficacy of all the mechanism of this complicated engine, and the propriety of all the manœuvres which the seaman practises, depend on the invariable laws of mechanics; and a thorough knowledge of these would enable an intelligent person not only to understand the machine and the manner of working it, but to improve both.

Unfortunately this is a subject of very great difficulty; and although it has employed the genius of Newton, and he has considered it with great care, and his followers have added more to his labours on this subject than on any other, it still remains in a very imperfect state.

A minute discussion of this subject cannot therefore be expected in a work like this: we must content ourselves with such a general statement of the most approved doctrine on the subject as shall enable our readers to conceive it distinctly, and judge with intelligence and confidence of the practical deductions which may be made from it.

314 Impulse and resistance of air. It is evidently a branch of the general theory of the impulse and resistance of fluids, which belongs to HYDRAULICS, but will be better understood when the mechanical properties of compressible fluids have been considered. It was thought very reasonable to suppose that the circumstances of elasticity would introduce the same changes in the impulse and resistance of fluids that it does in solid bodies. It would greatly divert the attention from the distinctive properties of air, if we should in this place enter on this subject, which is both extensive and difficult. We reckon it better therefore to take the whole together: this we shall do under the article RESISTANCE

Resistance of Fluids, and confine ourſelves at preſent to what relates to the impulſe and reſiſtance of air alone; anticipating a few of the general propoſitions of that theory, but without demonſtration, in order to underſtand the applications which may be made of it.

Fig. 86. Suppoſe then a plane ſurface, of which *a* C (fig. 86.) is the ſection, expoſed to the action of a ſtream of wind blowing in the direction QC, perpendicular to *a* C. The motion of the wind will be obſtructed, and the ſurface *a* C preſſed forward. And as all impulſe or preſſure is exerted in a direction perpendicular to the ſurface, and is reſiſted in the oppoſite direction, the ſurface will be impelled in the direction CD, the continuation of QC. And as the mutual actions of bodies depend on their relative motions, the force acting on the ſurface *a* C will be the ſame, if we ſhall ſuppoſe the air at reſt, and the ſurface moving equally ſwift in the oppoſite direction. The reſiſtance of the air to the motion of the body will be equal to the impulſe of the air in the former caſe. Thus reſiſtance and impulſe are equal and contrary.

315 Air moving with a double velocity will generally impel as the ſquare of that velocity.

If the air be moving twice as faſt, its particles will give a double impulſe; but in this caſe a double number of particles will exert their impulſe in the ſame time: the impulſe will therefore be fourfold; and in general it will be as the ſquare of the velocity: or if the air and body be both in motion, the impulſe and reſiſtance will be proportional to the ſquare of the relative velocity.

This is the firſt propoſition on the ſubject, and it appears very conſonant to reaſon. There will therefore be ſome analogy between the force of the air's impulſe or the reſiſtance of a body, and the weight of a column of air incumbent on the ſurface; for it is a principle in the action of fluids, that the heights of the columns of fluid are as the ſquares of the velocities which their preſſures produce. Accordingly the ſecond propoſition is, that the abſolute impulſe of a ſtream of air, blowing perpendicularly on any ſurface, is equal to the weight of a column of air which has that ſurface for its baſe, and for its height the ſpace through which a body muſt fall in order to acquire the velocity of the air.

Thirdly, Suppoſe the ſurface AC equal to *a* C no longer to be perpendicular to the ſtream of air, but inclined to it in the angle ACD, which we ſhall call the *angle of incidence*; then, by the reſolution of forces, it follows, that the action of each particle is diminiſhed in the proportion of radius to the ſine of the angle of incidence, or of AC to AL, AL being perpendicular to CD.

Again: Draw AK parallel to CD. It is plain that no air lying farther from CD than KA is will ſtrike the plane. The quantity of impulſe therefore is diminiſhed ſtill farther in the proportion of *a* C to KC, or of AC to AL. Therefore, on the whole, the abſolute impulſe is diminiſhed in the proportion of AC² to AL²: hence the propoſition, that the impulſe and reſiſtance of a given ſurface are in the proportion of the ſquare of the ſine of the angle of incidence.

Fourthly, This impulſe is in the direction PL, perpendicular to the impelled ſurface, and the ſurface tends to move in this direction: but ſuppoſe it moveable only in ſome other direction PO, or that it is in the direction PO that we wiſh to employ this impulſe, its action is therefore oblique; and if we wiſh to know the intenſity of the impulſe in this direction, it muſt be diminiſhed ſtill farther in the proportion of radius to the coſine of the angle LPO or ſine of CPO. Hence the general propoſition: The *effective impulſe is as the ſurface, as the ſquare of the velocity of the wind, as the ſquare of the ſine of the angle of incidence, and as the ſine of the obliquity jointly*, which we may expreſs by the ſymbol $R = S \cdot V^2 \cdot \textit{ſin.}^2 I \cdot \textit{ſin.}\ O$; and as the impulſe depends on the denſity of the impelling fluid, we may take in every circumſtance by the equation $R = S \cdot D \cdot V^2 \cdot \textit{ſin.}^2 I \cdot \textit{ſin.}\ O$. If the impulſe be eſtimated in the direction of the ſtream, the angle of obliquity ACD is the ſame with the angle of incidence, and the impulſe in this direction is as the ſurface, as the ſquare of the velocity, and as the cube of the angle of incidence jointly.

It evidently follows from theſe premiſes, that if ACA′ be a wedge, of which the baſe AA′ is perpendicular to the wind, and the angle ACA′ biſected by its direction, the direct or perpendicular impulſe on the baſe is to the oblique impulſe on the ſides as radius to the ſquare of the ſine of half the angle ACA′.

The ſame muſt be affirmed of a pyramid or cone ACA′, of which the axis is in the direction of the wind.

If ACA′ (fig. 87.) repreſent the ſection of a ſolid, Fig. 87. produced by the revolution of a curve line APC round the axis CD, which lies in the direction of the wind, the impulſe on this body may be compared with the direct impulſe on this baſe, or the reſiſtance to the motion of this body through the air may be compared with the direct reſiſtance of its baſe, by reſolving its ſurface into elementary planes P*p*, which are coincident with a tangent plane PR, and comparing the impulſe on P*p* with the direct impulſe on the correſponding part K*k* of the baſe.

In this way it follows that the impulſe on a ſphere is one half of the impulſe on its great circle, or on the baſe of a cylinder of equal diameter.

We ſhall conclude this ſketch of the doctrine with a very important propoſition to determine the moſt advantageous poſition of a plane ſurface, when required to move in one direction while it is impelled by the wind blowing in a different direction. Thus,

316 Important inference from this doctrine.

Let AB (fig. 88.) be the ſail of a ſhip, CA the direction in which the wind blows, and AD the line of the ſhip's courſe. It is required to place the yard AC in ſuch a poſition that the impulſe of the wind upon the ſail may have the greateſt effect poſſible in impelling the ſhip along AD.

Let AB, A*b*, be two poſitions of the ſail very near Fig. 88. the beſt poſition, but on oppoſite ſides of it. Draw BE, *be*, perpendicular to CA, and BF, *bf*, perpendicular to AD, calling AB radius; it is evident that BE, BF, are the ſines of impulſe and obliquity, and that the effective impulſe is $BE^2 \times BF$, or $be^2 \times bf$. This muſt be a maximum.

Let the points B, *b*, continually approach and ultimately coincide; the chord *b*B will ultimately coincide with a ſtraight line CBD touching the circle in B; the triangles CBE, *cbe* are ſimilar, as alſo the triangles DBF, D*bf*: therefore $BE^2 : be^2 = BC^2 : bc^2$, and $BF : bf = BD : bD$; and $BE^2 \times BF : be^2 \times bf = CB^2 \times BD : cb^2 \times bD$. Therefore when AB is in the beſt poſition, ſo that $BE^2 \times BF$ is greater than $be^2 \times bf$, we ſhall have $CB \times BD$ greater than $Cb^2 \times bD$, or $cB^2 \times BD$ is

Velocity of Wind.

is alſo a maximum. This we know to be the caſe when CB=2BD: therefore the ſail muſt be ſo placed that the tangent of the angle of incidence ſhall be double of the tangent of the angle of the ſail and keel.

In a common windmill the angle CAD is neceſſarily a right angle; for the ſail moves in a circle to which the wind is perpendicular: therefore the beſt angle of the ſail and axle will be $54^{\circ}.44$ nearly.

Such is the theory of the reſiſtance and impulſe of the air. It is extremely ſimple and of eaſy application. In all phyſical theories there are aſſumptions which depend on other principles, and thoſe on the judgment of the naturaliſt; ſo that it is always proper to confront the theory with experiment. There are even circumſtances in the preſent caſe which have not been attended to in the theory. When a ſtream of air is obſtructed by a ſolid body, or when a ſolid body moves along in air, the air is condenſed before it and rarefied behind. There is therefore a preſſure on the anterior parts ariſing from this want of equilibrium in the elaſticity of the air. This muſt be ſuperadded to the force ariſing from the impetus or inertia of the air. We cannot tell with preciſion what may be the amount of this condenſation; it depends on the velocity with which any condenſation diffuſes itſelf.

Alſo, if the motion be ſo rapid that the preſſure of the atmoſphere cannot make the air immediately occupy the place quitted by the body, it will ſuſtain this preſſure on its fore part to be added to the other forces.

317 Account of the principal experiments on this ſubject.

Experiments on this ſubject are by no means numerous; at leaſt ſuch experiments as can be depended on for the foundation of any practical application. The firſt that have this character are thoſe publiſhed by Mr Robins in 1742 in his treatiſe on Gunnery. They were repeated with ſome additions by the Chevalier Borda, and ſome account of them publiſhed in the Memoirs of the Academy of Sciences in 1763. In the Philoſophical Tranſactions of the Royal Society of London, vol. lxxiii. there are ſome experiments of the ſame kind on a larger ſcale by Mr Edgeworth. Theſe were all made in the way deſcribed in our account of Mr Robins's improvements in gunnery. Bodies were made to move with determined velocities, and the reſiſtances were meaſured by weights.

In all theſe experiments the reſiſtances were found very exactly in the proportion of the ſquares of the velocities; but they were found conſiderably greater than the weight of the column of air, whoſe height would produce the velocity in a falling body. Mr Robins's experiments on a ſquare of 16 inches, deſcribing 25.2 feet per ſecond, indicate the reſiſtance to be to this weight nearly as 4 to 3. Borda's experiments on the ſame ſurface ſtate the diſproportion ſtill greater.

The reſiſtances are found not to be in the proportion of the ſurfaces, but increaſe conſiderably faſter. Surfaces of 9, 16, 36, and 81 inches, moving with one velocity, had reſiſtances in the proportion of 9, $17\frac{1}{2}$, $42\frac{1}{4}$, and $104\frac{1}{4}$.

Now as this deviation from the proportion of the ſurfaces increaſes with great regularity, it is moſt probable that it continues to increaſe in ſurfaces of ſtill greater extent; and theſe are the moſt generally to be met with in practice in the action of wind on ſhips and mills.

Borda's experiments on 81 inches ſhow that the impulſe of wind moving one foot per ſecond is about $\frac{1}{500}$ of a pound on a ſquare foot. Therefore to find the impulſe on a foot correſponding to any velocity, divide the ſquare of the velocity by 500, and we obtain the impulſe in pounds. Mr Rouſe of Leiceſterſhire made many experiments, which are mentioned with great approbation by Mr Smeaton. His great ſagacity and experience in the erection of windmills oblige us to pay a conſiderable deference to his judgment. Theſe experiments confirm our opinion, that the impulſes increaſe faſter than the ſurfaces. The following table was calculated from Mr Rouſe's obſervations, and may be conſidered as pretty near the truth.

Velocity in Feet.	Impulſe on a Foot in Pounds.
0	0,000
10	0,229
20	0,915
30	2,059
40	3,660
50	5,718
60	8,234
70	11,207
80	14,638
90	18,526
100	22,872
110	27,675
120	32,926
130	38,654
140	44,830
150	51,462

If we multiply the ſquare of the velocity in feet by 16, the product will be the impulſe or reſiſtance in a ſquare foot in grains, according to Mr Rouſe's numbers.

The greateſt deviation from the theory occurs in the oblique impulſes. Mr Robins compared the reſiſtance of a wedge, whoſe angle was 90°, with the reſiſtance of its baſe; and inſtead of finding it leſs in the proportion of $\sqrt{2}$ to 1, as determined by the theory, he found it greater in the proportion of 55 to 68 nearly; and when he formed the body into a pyramid, of which the ſides had the ſame ſurface and the ſame inclination as the ſides of the wedge, the reſiſtance of the baſe and face were now as 55 to 39 nearly: ſo that here the ſame ſurface with the ſame inclination had its reſiſtance reduced from 68 to 39 by being put into this form. Similar deviations occur in the experiments of the Chevalier Borda; and it may be collected from both, that the reſiſtances diminiſh more nearly in the proportion of the ſines of incidence than in the proportion of the ſquares of thoſe ſines.

The irregularity in the reſiſtance of curved ſurfaces is as great as in plane ſurfaces. In general, the theory gives the oblique impulſes on plane ſurfaces much too ſmall, and the impulſes on curved ſurfaces too great. The reſiſtance of a ſphere does not exceed the fourth part of the reſiſtance of its great circle, inſtead of being its half; but the anomaly is ſuch as to leave hardly any room for calculation. It would be very deſirable to have the experiments on this ſubject repeated in a greater variety of caſes, and on larger ſurfaces, ſo that the errors of the experiments may be of leſs conſequence.

Till

Reſiſtance of Air in Gunnery.

Till this matter be reduced to ſome rule, the art of working ſhips muſt remain very imperfect, as muſt alſo the conſtruction of windmills.

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It is of great conſequence to know the reſiſtance of air in the motion of bullets, &c.

The caſe in which we are moſt intereſted in the knowledge of the reſiſtance of the air is the motion of bullets and ſhells. Writers on artillery have long been ſenſible of the great effect of the air's reſiſtance. It ſeems to have been this conſideration that chiefly engaged Sir Iſaac Newton to conſider the motions of bodies in a reſiſting medium. A propoſition or two would have ſufficed for ſhowing the incompatibility of the planetary motions with the ſuppoſition that the celeſtial ſpaces were filled with a fluid matter; but he has with great ſolicitude conſidered the motion of a body projected on the ſurface of the earth, and its deviation from the parabolic track aſſigned by Galileo. He has beſtowed more pains on this problem than any other in his whole work; and his inveſtigation has pointed out almoſt all the improvements which have been made in the application of mathematical knowledge to the ſtudy of nature. Nowhere does his ſagacity and fertility of reſource appear in ſo ſtrong a light as in the ſecond book of the *Principia*, which is almoſt wholly occupied by this problem. The celebrated mathematician John Bernouilli engaged in it as the fineſt opportunity of diſplaying his ſuperiority. A miſtake committed by Newton in his attempt to a ſolution was matter of triumph to him; and the whole of his performance, though a piece of elegant and elaborate geometry, is greatly hurt by his continually bringing this miſtake (which is a mere trifle) into view. The difficulty of the ſubject is ſo great, that ſubſequent mathematicians ſeem to have kept aloof from it; and it has been entirely overlooked by the many voluminous writers who have treated profeſſedly on military projectiles. They have ſpoken indeed of the reſiſtance of the air as affecting the flight of ſhot, but have ſaved themſelves from the taſk of inveſtigating this effect (a taſk to which they were unequal), by ſuppoſing that it was not ſo great as to render their theories and practical deductions very erroneous. Mr Robins was the firſt who ſeriouſly examined the ſubject. He ſhowed, that even the Newtonian theory (which had been corrected, but not in the ſmalleſt degree improved or extended in its principles) was ſufficient to ſhew that the path of a cannon ball could not reſemble a parabola. Even this theory ſhowed that the reſiſtance was more than eight times the weight of the ball, and ſhould produce a greater deviation from the parabola than the parabola deviated from a ſtraight line.

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The ignorance of the writers on artillery in this reſpect.

This ſimple but ſingular obſervation was a ſtrong proof how faulty the profeſſed writers on artillery had been, in rather amuſing themſelves with elegant but uſeleſs applications of eaſy geometry, than in endeavouring to give their readers any uſeful information. He added, that the difference between the ranges by the Newtonian theory and by experiment was ſo great, that the reſiſtance of the air muſt be vaſtly ſuperior to what that theory ſuppoſed. It was this which ſuggeſted to him the neceſſity of experiments to aſcertain this point. We have ſeen the reſult of theſe experiments in moderate velocities; and that they were ſufficient for calling the whole theory in queſtion, or at leaſt for rendering it uſeleſs. It became neceſſary, therefore, to ſettle every point by means of a direct experiment. Here was a great difficulty. How ſhall we meaſure either theſe great velocities which are obſerved in the motions of cannon-ſhot, or the reſiſtances which theſe enormous velocities occaſion? Mr Robins had the ingenuity to do both. The method which he took for meaſuring the velocity of a muſket-ball was quite original; and it was ſuſceptible of great accuracy. We have already given an account of it under the article GUNNERY. Having gained this point, the other was not difficult. In the moderate velocities he had determined the reſiſtances by the forces which balanced them, the weights which kept the reſiſted body in a ſtate of uniform motion. In the great velocities, he propoſed to determine the reſiſtances by their immediate effects, by the retardations which they occaſioned. This was to be done by firſt aſcertaining the velocity of the ball, and then meaſuring its velocity after it had paſſed through a certain quantity of air. The difference of theſe velocities is the retardation, and the proper meaſure of the reſiſtance; for, by the initial and final velocities of the ball, we learn the time which was employed in paſſing through this air with the medium velocity. In this time the air's reſiſtance diminiſhed the velocity by a certain quantity. Compare this with the velocity which a body projected directly upwards would loſe in the ſame time by the reſiſtance of gravity. The two forces muſt be in the proportion of their effects. Thus we learn the proportion of the reſiſtance of the air to the weight of the ball. It is indeed true, that the time of paſſing through this ſpace is not accurately had by taking the arithmetical medium of the initial and final velocities, nor does the reſiſtance deduced from this calculation accurately correſpond to this mean velocity; but both may be accurately found by the experiment by a very troubleſome computation, as is ſhown in the 5th and 6th propoſitions of the ſecond book of Newton's *Principia*. The difference between the quantities thus found and thoſe deduced from the ſimple proceſs is quite trifling, and far within the limits of accuracy attainable in experiments of this kind; it may, therefore, be ſafely neglected.

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Mr Robins made many experiments on this ſubject.

Mr Robins made many experiments on this ſubject; but unfortunately he has publiſhed only a very few, ſuch as were ſufficient for aſcertaining the point he had in view. He intended a regular work on the ſubject, in which the gradual variations of reſiſtance correſponding to different velocities ſhould all be determined by experiment: but he was then newly engaged in an important and laborious employment, as chief engineer to the Eaſt India Company, in whoſe ſervice he went out to India, where he died in leſs than two years. It is to be regretted that no perſon has proſecuted theſe experiments. It would be neither laborious nor difficult, and would add more to the improvement of artillery than any thing that has been done ſince Mr Robins's death, if we except the proſecution of his experiments on the initial velocities of cannon-ſhot by Dr Charles Hutton royal profeſſor at the Woolwich Academy. It is to be hoped that this gentleman, after having with ſuch effect and ſucceſs extended Mr Robins's experiments on the initial velocities of muſket-ſhot to cannon, will take up this other ſubject, and thus give the art of artillery all the ſcientific foundation which it can receive in the preſent ſtate of our mathematical knowledge. Till then we muſt content ourſelves with the practical rules which Robins has deduced from his own experiments. As he has not given us the mode of deduction, we muſt compare the reſults with

with experiment. He has indeed given a very extenſive compariſon with the numerous experiments made both in Britain and on the continent; and the agreement is very great. His learned commentator Euler has been at no pains to inveſtigate theſe rules, and has employed himſelf chiefly in detecting errors, moſt of which are ſuppoſed, becauſe he takes for a finiſhed work what Mr Robins only gives to the public as a haſty but uſeful ſketch of a new and very difficult branch of ſcience.

321 General reſult of them, &c.

The general reſult of Robins's experiments on the retardation of muſket-ſhot is, that although in moderate velocities the reſiſtance is ſo nearly in the duplicate proportion of the velocities that we cannot obſerve any deviation, yet in velocities exceeding 200 feet per ſecond the retardations increaſe faſter, and the deviation from this rate increaſes rapidly with the velocity. He aſcribes this to the cauſes already mentioned, viz. the condenſation of the air before the ball and to the rarefaction behind, in conſequence of the air not immediately occupying the ſpace left by the bullet. This increaſe is ſo great, that if the reſiſtance to a ball moving with the velocity of 1700 feet in a ſecond be computed on the ſuppoſition that the reſiſtance obſerved in moderate velocities is increaſed in the duplicate ratio of the velocity, it will be found hardly one-third part of its real quantity. He found, for inſtance, that a ball moving through 1670 feet in a ſecond loſt about 125 feet per ſecond of its velocity in paſſing through 50 feet of air. This it muſt have done in the $\frac{1}{30}$ of a ſecond, in which time it would have loſt one foot if projected directly upwards; from which it appears that the reſiſtance was about 125 times its weight, and more than three times greater than if it had increaſed from the reſiſtance in ſmall velocities in the duplicate ratio of the velocities. He relates other experiments which ſhow ſimilar reſults.

But he alſo mentions a ſingular circumſtance, that till the velocities exceed 1100 feet per ſecond, the reſiſtances increaſe pretty regularly, in a ratio exceeding the duplicate ratio of the velocities; but that in greater velocities the reſiſtances become ſuddenly triple of what they would have been, even according to this law of increaſe. He thinks this explicable by the vacuum which is then left behind the ball, it being well known that air ruſhes into a vacuum with the velocity of 1132 feet per ſecond nearly. Mr Euler controverts this concluſion, as inconſiſtent with that gradation which is obſerved in all the operations of nature; and ſays, that although the vacuum is not produced in ſmaller velocities than this, the air behind the ball muſt be ſo rare (the ſpace being but imperfectly filled), that the preſſure on the anterior part of the ball muſt gradually approximate to that preſſure which an abſolute vacuum would produce; but this is like his other criticiſms. Robins does nowhere aſſert that this ſudden change of reſiſtance happens in the tranſition of the velocity from 1132 feet to that of 1131 feet 11 inches or the like, but only that it is very ſudden and very great. It may be ſtrictly demonſtrated, that ſuch a change muſt happen in a narrow enough limit of velocities to juſtify the appellation of ſudden: a ſimilar fact may be obſerved in the motion of a ſolid through water. If it be gradually accelerated, the water will be found nearly to fill up its place, till the velocity arrives at a certain magnitude, correſponding to the immerſion of the body in the water; and then the ſmalleſt augmentation of its motion immediately produces a void behind it, into which the water ruſhes in a violent manner and is daſhed into froth. A gentleman, who has had many opportunities for ſuch obſervations, aſſures us, that when ſtanding near the line of direction of a cannon diſcharging a ball with a large allotment of powder, ſo that the initial velocity certainly exceeded 1100 feet per ſecond, he always obſerved a very ſudden diminution of the noiſe which the bullet made during its paſſage. Although the ball was coming towards him, and therefore its noiſe, if equable, would be continually increaſing, he obſerved that it was loudeſt at firſt. That this continued for a ſecond or two, and ſuddenly diminiſhed, changing to a ſound which was not only weaker, but differed in kind, and gradually increaſed as the bullet approached him. He ſaid, that the firſt noiſe was like the hiſſing of red-hot iron in water, and that the ſubſequent noiſe rather reſembled a hazy whiſtling. Such a change of ſound is a neceſſary conſequence of the different agitation of the air in the two caſes. We know alſo, that air ruſhing into a void, as when we break an exhauſted bottle, makes a report like a muſket.

322 Partly controverted by Euler, but without ſufficient grounds.

Mr Robins's aſſertion therefore has every argument for its truth that the nature of the thing will admit. But we are not left to this vague reaſoning: his experiments ſhow us this diminution of reſiſtance. It clearly appears from them, that in a velocity of 1700 feet the reſiſtance is more than three times the reſiſtance determined by the theory which he ſuppoſes the common one. When the velocity was 1065 feet, the actual reſiſtance was $\frac{11}{4}$ of the theoretical; and when the velocity was 400 feet, the actual reſiſtance was about $\frac{4}{3}$ of the theoretical. That he aſſumed a theory of reſiſtance which gave them all too ſmall, is of no conſequence in the preſent argument.

323 Rule by Robins for computing reſiſtances and very rapid motions.

Mr Robins, in ſumming up the reſults of his obſervations on this ſubject, gives a rule very eaſily remembered for computing the reſiſtances to thoſe very rapid motions. It has been already mentioned in the article GUNNERY, but we repeat it here, in order to accommodate it to the quantities which have been determined in ſome degree by experiment.

A C B D

Let AB repreſent the velocity of 1700 feet per ſecond, and AC any other velocity. Make BD to AD as the reſiſtance given by the ordinary theory to the reſiſtance actually obſerved in the velocity 1700: then will CD be to AD as the reſiſtance aſſigned by the ordinary theory to the velocity AC is to that which really correſponds to it.

To accommodate this to experiment, recollect * that a ſphere of the ſize of a 12 pound iron ſhot, moving 25 feet in a ſecond, had a reſiſtance of $\frac{1}{12}$ of a pound. Augment this in the ratio of 25^2 to 1700^2, and we obtain 210 nearly for the theoretical reſiſtance to this velocity; but by comparing its diameter of $4\frac{1}{2}$ inches with $\frac{3}{4}$, the diameter of the leaden ball, which had a reſiſtance of at leaſt 11 pounds with this velocity, we conclude that the 12 pound ſhot would have had a reſiſtance of 396 pounds: therefore BD : AD=210 : 396, and AB : AD=186 : 396; and AB being 1700, AD will be 3613.

Let AD=a, AC=x, and let R be the reſiſtance to a 12 pound iron ſhot moving one foot per ſecond, and r the reſiſtance (in pounds) wanted for the velocity x; we-

* See Gunnery, N° 19. &c.

Undulation of Air.

we have $r = R\frac{a x^2}{a - x}$. Mr Robins's experiments give $R = \frac{1}{13750}$ very nearly. This gives $R a = 0{,}263235$, which is nearly one-fourth. Thus our formula becomes $r = \frac{0.263235\, x^2}{3613 - x}$, or very nearly $\frac{x^2}{4(3613 - x)}$, falling short of the truth about $\frac{1}{10}$th part. The simplicity of the formula recommends it to our use, and when we increase its result $\frac{1}{10}$, it is incomparably nearer to the true result of the theory as corrected by Mr Robins than we can hope that the theory is to the actual resistance. We can easily see that Mr Robins's correction is only a sagacious approximation. If we suppose the velocity 3613 feet, a very possible thing, the resistance by this formula is infinite, which cannot be. We may even suppose that the resistance given by the formula is near the truth only in such velocities as do not greatly exceed 1700 feet per second. No military projectile exceeds 2200, and it is great folly to make it so great, because it is reduced to 1700 almost in an instant, by the enormous resistance.

The resistance to other balls will be made by taking them in the duplicate ratio of the diameters.

324 The discussions of mathematicians not easily applied.

It has been already observed, that the first mathematicians of Europe have lately employed themselves in improving this theory of the motion of bodies in a resisting medium; but their discussions are such as few artillerists can understand. The problem can only be solved by approximation, and this by the quadrature of very complicated curves. They have not been able therefore to deduce from them any practical rules of easy application, and have been obliged to compute tables suited to different cases.

325 Borda's and Robins's apparently the best.

Of these performances, that of the Chevalier Borda, in the Memoirs of the Academy of Sciences for 1769, seems the best adapted to military readers, and the tables are undoubtedly of considerable use; but it is not too much to say, that the simple rules of Mr Robins are of as much service, and are more easily remembered: besides, it must be observed, that the nature of military service does not give room for the application of any very precise rule. The only advantage that we can derive from a perfect theory would be an improvement in the construction of pieces of ordnance, and a more judicious appropriation of certain velocities to certain purposes. The service of a gun or mortar must always be regulated by the eye.

326 Undulation of air.

There is another motion of which air and other elastic fluids are susceptible, viz. an internal vibration of their particles, or undulation, by which any extended portion of air is distributed into alternate parcels of condensed and rarefied air, which are continually changing their condition without changing their places. By this change the condensation which is produced in one part of the air is gradually transferred along the mass of air to the greatest distances in all directions. It is of importance to have some distinct conception of this motion. It is found to be by this means that distant bodies produce in us the sensation of sound. See ACOUSTICS. Sir Isaac Newton treated this subject with his accustomed ingenuity, and has given us a theory of it in the end of the second book of his *Principia*. This theory has been objected to with respect to the conduct of the argument, and other explanations have been given by the most eminent mathematicians. Though they appear to differ from Newton's, their results are precisely the same; but, on a close examination, they differ no more than John Bernouilli's theorem of centripetal forces differs from Newton's, viz. the one being expressed by geometry and the other by literal analysis. The celebrated De la Grange reduces Newton's investigation to a tautological proposition or identical equation; but Mr Young of Trinity college, Dublin, has, by a different turn of expression, freed Newton's method from this objection. We shall not repeat it here, but refer our mathematical readers to the article ACOUSTICS, as it is not our business at present to consider its connection with sound.

327 Has been used to explain a variety of natural phenomena.

But since Newton published this theory of aerial undulations, and of their propagation along the air, and since the theory has been so corrected and improved as to be received by the most accurate philosophers as a branch of natural philosophy susceptible of rigid demonstration, it has been freely resorted to by many writers on other parts of natural science, who did not profess to be mathematicians, but made use of it for explaining phenomena in their own line on the authority of the mathematicians themselves. Learning from them that this vibration, and the *quaquaversum* propagation of the pulses, were the necessary properties of an elastic fluid, and that the rapidity of this propagation had a certain assignable proportion to the elasticity and density of the fluid, they freely made use of these concessions, and have introduced elastic vibrating fluids into many facts, where others would suspect no such thing, and have attempted to explain by their means many abstruse phenomena of nature. Æthers are everywhere introduced, endued with great elasticity and tenuity. Vibrations and pulses are supposed in this æther, and these are offered as explanations. The doctrines of animal spirits and nervous fluids, and the whole mechanical system of Hartley, by which the operations of the soul are said to be explained, have their foundation in this theory of aerial undulations. If these fancied fluids, and their internal vibrations, really operate in the phenomena ascribed to them, any explanation that can be given of the phenomena from this principle must be nothing else than showing that the legitimate consequences of these undulations are similar to the phenomena; or, if we are no more able to see this last step than in the case of sound (which we know to be *one* consequence of the aerial undulations, although we cannot tell how), we must be able to point out, as in the case of sound, certain constant relations between the general laws of these undulations and the general laws of the phenomena. It is only in this way that we think ourselves entitled to say that the aerial undulations are causes, though not the only causes, of sound; and it is because there is no such relation, but, on the contrary, a total dissimilarity, to be observed between the laws of elastic undulations and the laws of the propagation of light, that we assert with confidence that ethereal undulations are not the causes of vision.

328 But the application not being made with sufficient precision.

Explanations of this kind suppose, therefore, in the first place, that the philosopher who proposes them understands precisely the nature of these undulations; in the next place, that he makes his reader sensible of those circumstances of them which are concerned in the effect to be explained; and, in the third place, that he makes the reader understand how this circumstance of the vibrating fluid is connected with the phenomenon, either by showing it to be its mechanical cause,

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as when the philosopher explains the resounding of a musical chord to a flute or pipe which gave the same tone; or by showing that this circumstance of the undulation always accompanies the phenomenon, as when the philosopher shows that 233 vibrations of air in a second, in whatever manner or by whatever cause they are produced, always are followed by the sensation of the tone C in the middle of the harpsichord.

But here we must observe, that, with the exception of Euler's unsuccessful attempt to explain the optical phenomena by the undulations of ether, we have met with no explanation of natural phenomena, by means of elastic and vibrating fluids, where the author has so much as attempted any one of these three things, so indispensably requisite in a logical explanation. They have talked of vibrations without describing them, or giving the reader the least notion of what kind they are; and in no instance that we can recollect have they showed how such vibrations could have any influence in the phenomenon. Indeed, by not describing with precision the undulations, they were freed from the task of showing them to be mechanical causes of the phenomenon; and when any of them show any analogy between the general laws of elastic undulations and the general laws of the phenomenon, the analogy is so vague, indistinct, or partial, that no person of common prudence would receive it as argument in any case in which he was much interested.

329 Has become the foundation of materialism.

We think it our duty to remonstrate against this slovenly way of writing: we would even hold it up to reprobation. It has been chiefly on this faithless foundation that the blind vanity of men has raised that degrading system of opinions called MATERIALISM, by which the affections and faculties of the soul of man have been resolved into vibrations and pulses of ether.

330 Of the motion of elastic fluids.

We also think it our duty to give some account of this motion of elastic fluids. It must be such an account as shall be understood by those who are not mathematicians, because those only are in danger of being misled by the improper application of them. Mathematical discussion is, however, unavoidable in a subject purely mathematical; but we shall introduce nothing that may not be easily understood or confided in; and we trust that mathematical readers will excuse us for a mode of reasoning which appears to them lax and inelegant.

331 How they differ from unelastic fluids in propagating any agitation of their parts.

The first thing incumbent on us is to show how elastic fluids differ from the unelastic in the propagation of any agitation of the parts. When a long tube is filled with water, and any one part of it pushed out of its place, the whole is instantly moved like a solid mass. But this is not the case with air. If a door be suddenly shut, the window at the farther end of a long and close room will rattle; but some time will elapse between the shutting of the door and the motion of the window. If some light dust be lying on a braced drum, and another be violently beat at a little distance from it, an attentive observer will see the dust dance up from the parchment; but this will be at the instant he hears the sound of the stroke on the other drum, and a sensible time after the stroke. Many such familiar facts show that the agitation is gradually communicated along the air; and therefore that when one particle is agitated by any sensible motion, a finite time, however small, must elapse before the adjoining particle is agitated in the same manner. This would not be the case in water if water be perfectly incompressible. We think that this may be made intelligible with very little trouble.

A a B b C D

Let A, B, C, D, &c, be a row of aerial particles, at such distances that their elasticity just balances the pressure of the atmosphere; and let us suppose (as is deducible from the observed density of air being proportional to the compressing force) that the elasticity of the particles, by which they keep each other at a distance, is as their distances inversely. Let us farther suppose that the particle A has been carried, with an uniform motion, to a by some external force. It is evident that B cannot remain in its present state; for being now nearer to a than to C, it is propelled towards C by the excess of the elasticity of A above the natural elasticity of C. Let E be the natural elasticity of the particles, or the force corresponding to the distance BC or BA, and let F be the force which impels B towards C, and let f be the force exerted by A when at a. We have

$$E : f = Ba : BC, = Ba : BA;$$
$$\text{and } E : f - E = Ba : BA - Ba = Ba : Aa;$$
$$\text{or } E : F = Ba : Aa.$$

Now in fig. 89. let ABC be the line joining three particles, to which draw FG, PH parallel, and IAF, HBG perpendicular. Take IF or HG to represent the elasticity corresponding to the distance AB. Let the particle A be supposed to have been carried with an uniform motion to a by some external force, and draw R a M perpendicular to RG, and make FI : RM = B a : BA. We shall then have FI : PM = B a : A a; and PM will represent the force with which the particle B is urged towards C. Suppose this construction to be made for every point of the line AB, and that a point M is thus determined for each of them, mathematicians know that all these points M lie in the curve of a hyperbola, of which FG and GH are the asymptotes. It is also known by the elements of mechanics, that since the motion of A along AB is uniform, A a or IP may be taken to represent the time of describing A a; and that the area IPM represents the whole velocity which B has acquired in its motion towards C when A has come to a, the force urging B being always as the portion PM of the ordinate. Fig. 89.

Take GX of any length in HG produced, and let GX represent the velocity which the uniform action of the natural elasticity IF could communicate to the particle B during the time that A would uniformly describe AB. Make GX to GY as the rectangle IFGH to the hyperbolic space IFRM, and draw YS cutting MR produced in S, and draw FX cutting MR in T. It is known to the mathematicians that the point S is in a curve line FSs called the *logarithmic curve*; of which the leading property is, that any line RS parallel to GX is to GX as the rectangle IFGH is to the hyperbolic space IFRM, and that FX touches the curve in F.

This being the case, it is plain, that because RT increases in the same proportion with FR, or with the rectangle IFRP, and RS increases in the proportion of the space IFRM, TS increases in the proportion of the space IPM. Therefore TS is proportional to the velocity of

of B when A has reached *a*, and RT is proportional to the velocity which the uniform action of the natural elasticity would communicate to B in the same time. Then since FT is as the time, and TS is as the velocity, the area FTS will be as the space described by B (urged by the variable force PM); while A, urged by the external force, describes A *a*; and the triangle FRT will represent the space which the uniform action of the natural elasticity would cause B to describe in the same time.

And thus it is plain that these three motions can be compared together: the uniform motion of the agitated particle A, the uniformly accelerated motion which the natural elasticity would communicate to B by its constant action, and the motion produced in B by the agitation of A. But this comparison, requiring the quadrature of the hyperbola and logarithmic curve, would lead us into most intricate and tedious computations. Of these we need only give the result, and make some other comparisons which are palpable.

Let A*a* be supposed indefinitely small in comparison of AB. The space described by A is therefore indefinitely small; but in this case we know that the ratio of the space FRT to the rectangle IFRP is indefinitely small. There is therefore no comparison between the agitation of A by the external force, and the agitation which natural elasticity would produce on a single particle in the same time, the last being incomparably smaller than the first. And this space FRT is incomparably greater than FTS; and therefore the space which B would describe by the uniform action of the natural elasticity is incomparably greater than what it would describe in consequence of the agitation of A.

From this reasoning we see evidently that A must be sensibly moved, or a finite or measurable time must elapse before B acquires a measurable motion. In like manner B must move during a measurable time before C acquires a measurable motion, &c.; and therefore the agitation of A is communicated to the distant particles in gradual succession.

By a farther comparison of these spaces we learn the time in which each succeeding particle acquires the very agitation of A. If the particles B and C only are considered, and the motion of C neglected, it will be found that B has acquired the motion of A a little before it has described $\frac{1}{3}$ of the space described by A; but if the motion of C be considered, the acceleration of B must be increased by the retreat of C, and B must describe a greater space in proportion to that described by A. By computation it appears, that when both B and C have acquired the velocity of A, B has described nearly $\frac{1}{2}$ of A's motion, and C more nearly $\frac{1}{2}$. Extending this to D, we shall find that D has described still more nearly $\frac{1}{2}$ of A's motion. And from the nature of the computation it appears that this approximation goes on rapidly: therefore, supposing it accurate from the very first particle, it follows from the equable motion of A, that each succeeding particle moves through an equal space in acquiring the motion of A.

The conclusion which we must draw from all this is, that when the agitation of A has been fully communicated to a particle at a *sensible* distance, the intervening particles, all moving forward with a common velocity, are equally compressed as to sense, except a very few of the first particles; and that this communication, or this propagation of the original agitation, goes on with an uniform velocity.

These computations need not be attended to by such as do not wish for an accurate knowledge of the precise agitation of each particle. It is enough for such readers to see clearly that time *must* escape between the agitation of A and that of a distant particle; and this is abundantly manifest from the incomparability (excuse the term) of the nascent rectangle IFRP with the nascent triangle FRT, and the incomparability of FRT with FTS.

What has now been shown of the communication of any sensible motion A *a* must hold equally with respect to any change of this motion. Therefore if a tremulous motion of a body, such as a spring or bell, should agitate the adjoining particle A by pushing it forward in the direction AB, and then allowing it to come back again in the direction BA, an agitation similar to this will take place in all the particles of the row one after the other. Now if this body vibrate according to the law of motion of a pendulum vibrating in a cycloid, the neighbouring particle of air *will of necessity* vibrate in the same manner; and then Newton's demonstration in art. ACOUSTICS needs no apology. Its only deficiency was, that it *seemed* to prove that this *would be* the way in which every particle would of necessity vibrate; which is not true, for the successive parcels of air will be differently agitated according to the original agitation. Newton only wants to prove the uniform propagation of the agitations, and he selects that form which renders the proof easiest. He proves, in the most unexceptionable manner, that if the particles of a pulse of air are really moving like a cycloidal pendulum, the forces acting on each particle, in consequence of the compression and dilatation of the different parts of the pulse, are precisely such as are necessary for continuing this motion, and therefore no other forces are required. Then since each particle is in a certain part of its path, is moving in a certain direction and with a certain velocity, and urged by a determined force, it *must* move in that very manner. The objection started by John Bernouilli against Newton's demonstration (in a single line) of the elliptical motion of a body urged by a force in the inverse duplicate ratio of the distance from the focus, is precisely the same with the objection against Newton's demonstration of the progress of aerial undulations, and is equally futile.

332 Newton's demonstration on this subject just as far as it goes;

It must, however, be observed, that Newton's demonstration proceeds on the supposition that the linear agitations of a particle are incomparably smaller than the extent of an undulation. This is not strictly the case in any instance, and in many it is far from being true. In a pretty strong twang of a harpsichord wire, the agitation of a particle may be near the 50th part of the extent of the undulation. This must disturb the regularity of the motion, and cause the agitations in the remote undulations to differ from those in the first pulse. In the explosion of a cannon, the breaking of an exhausted bottle, and many instances which may be given, the agitations are still greater. The commentators on Newton's *Principia*, Le Sueur and Jacquier, have shown, and Euler more clearly, that when the original agitations are very violent, the particles of air will acquire a subordinate vibration compounded with the regular cycloidal vibration, and the progress of the pulses will be

somewhat

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somewhat more rapid; but the intricacy of the calculus is so great, that they have not been able to determine with any tolerable precision what the change of velocity will be.

333 It is strengthened by comparing the sound of a cannon near and at a distance. All this, however, is fully confirmed by experiment on sounds. The sound of a cannon at 10 or 20 miles distance does not in the least resemble its sound when near. In this case it is a loud instantaneous crack, to which we can assign no musical pitch: at a distance, it is a grave sound, of which we can tell the note; and it begins softly, swells to its greatest loudness, and then dies away growling. The same may be said of a clap of thunder, which we know to be a loud snap of still less duration. It is highly probable that the appreciable tones which those distant sounds afford are produced by the continuance of these subordinate vibrations which are added together and fortified in the successive pulses, though not perceptible in the first, in a way somewhat resembling the resonance of a musical chord. Newton's explanation gathers evidence therefore from this circumstance. And we must further observe, that all elastic bodies tremble or vibrate almost precisely as a pendulum swinging in a cycloid, unless their vibrations are uncommonly violent; in which case they are quickly reduced to a moderate quantity by the resistance of the air. The only very loud sounds which we can produce in this way are from great bells; and in these the utmost extent of the vibration is very small in comparison with the breadth of the pulse. The velocity of these sounds has not been compared with that of cannon, or perhaps it would be found less, and an objection against Newton's determination removed. He gives 969 feet per second, Experiment 1142.

334 The agitation in all probability in the successive pulses assumes a cycloidal form. But it is also very probable, that in the propagation through the air, the agitation gradually and rapidly approaches to this regular cycloidal form in the successive pulses, in the same way as we observe that whatever is the form of agitation in the middle of a smooth pond of water, the spreading circles are always of one gentle form without asperities. In like manner, into whatever form we throw a stretched cord by the twang which we give it, it almost immediately makes smooth undulations, keeping itself in the shape of an elongated trochoid. Of this last we can demonstrate the necessity, because the case is simple. In the wave, the investigation is next to impossible; but we see the fact. We may therefore presume it in air. And accordingly we know that any noise, however abrupt and jarring, near at hand, is smooth at a distance. Nothing is more rough and harsh than the scream of a heron; but at half a mile's distance it is soft. The ruffle of a drum is also smooth at a distance.

Plate CCCCXXXII. fig. 90. Fig. 90. shows the successive situations of the particles of a row. Each line of the figure shows the same particles marked with the same letters; the first particle *a* being supposed to be removed successively from its quiescent situation and back to it again. The mark × is put on that part of each line where the agitated particles are at their natural distances, and the air is of the natural density. The mark 1 is put where the air is most of all compressed, and : where it is most of all dilated; the curve line drawn through the lowest line of the figure is intended to represent the density in every point, by drawing ordinates to it from the straight line: the ordinates below the line indicate a rarity, and those above the line a density, greater than common.

It appears that when *a* has come back to its natural situation, the part of greatest density is between the particles *i* and *k*, and the greatest rarity between *c* and *d*.

We have only to add, that the velocity of this propagation depends on the elasticity and density of the fluid. If these vary in the same proportion, that is, if the fluid has its elasticity proportional to its density, the velocity will remain the same. If the elasticity or density alone be changed, the velocity of the undulations will change in the direct subduplicate ratio of the elasticity and the inverse subduplicate ratio of the density; for should the elasticity be quadrupled, the quantity of motion produced by it in any given time will be quadrupled. This will be the case if the velocity be doubled; for there would then be double the number of particles doubly agitated. Should the density be quadrupled, the elasticity remaining the same, the quantity of motion must remain the same. This will be the case if the velocity be reduced to one half; for this will propagate half the agitation to half the distance, which will communicate it to twice the number of particles, and the quantity of motion will remain the same. The same may be said of other proportions, and therefore $V = \frac{\sqrt{F}}{\sqrt{D}}$. Therefore a change in the barometer will not affect the velocity of the undulations in air; but they will be accelerated by heat, which diminishes its density, or increases its elasticity. The velocity of the pulses in inflammable air must be at least thrice as great, because its density is but one-tenth of that of air when the elasticity of both are the same.

335 Farther consideration of aerial pulses as they really occur. Let us now attend a little to the propagation of aerial pulses as they really happen; for this hypothesis of a single row of particles is nowhere to be observed.

Fig. 91. Suppose a sphere A, fig. 91. filled with condensed air, and that the vessel which contains it is suddenly annihilated. The air must expand to its natural dimensions, suppose BCD. But it cannot do this without pressing aside the surrounding air. We have seen that in any single row of particles this cannot be at once diffused to a distance, but must produce a condensation in the air adjoining; which will be gradually propagated to a distance. Therefore this sphere BCD of the common density will form round it a shell, bounded by EFG, of condensed air. Suppose that at this instant the inner air BCD becomes solid. The shell of condensed air can expand only outwards. Let it expand till it is of the common density, occupying the shell HIK. This expansion, in like manner, must produce a shell of condensed air without it: at this instant let HIK become solid. The surrounding shell of condensed air can expand only outward, condensing another shell without it. It is plain that this must go on continually, and the central agitation will be gradually propagated to a distance in all directions. But, in this process, it is not the same numerical particles that go to a distance. Those of the original sphere go no further than BCD, those of the next shall go no farther than HIK, &c. Farther, the expansion outwards of any particle will be more moderate as the diffusion advances; for the whole motion of each

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each ſhell cannot exceed the original quantity of motion; and the number of particles in each ſucceſſive ſhell increaſes as the ſurface, that is, as the ſquare of the diſtance from the centre; therefore the agitation of the particles will decreaſe in the ſame ratio, or will be in the inverſe duplicate ratio of the diſtance from the centre. Each ſucceſſive ſhell, therefore, contains the ſame quantity of motion, and the ſucceſſive agitations of the particles of any row out from the centre will not be equal to the original agitation, as happens in the ſolitary row. But this does not affect the velocity of the propagation, becauſe all agitations are propagated equally faſt.

We ſuppoſed the air A to become ſolid as ſoon as it acquired the common denſity; but this was to facilitate the conception of the diffuſion. It does not ſtop at this bulk; for while it was denſer it had a tendency to expand. Therefore each particle has attained this diſtance with an accelerated motion. It will, therefore, continue this motion like a pendulum that has paſſed the perpendicular, till it is brought to reſt by the air without it; and it is now rarer than common air, and collapſes again by the greater elaſticity of the air without it. This outward air, therefore, in regaining its natural denſity, muſt expand both ways. It expands towards the centre, following the collapſing of the air within it; and it expands outwards, condenſing the air beyond it. By expanding inwards, it will again condenſe the air within it, and this will again expand; a ſimilar motion happens in all the outward ſhells; and thus there is propagated a ſucceſſion of condenſed and rarefied ſhells of air, which gradually ſwell to the greateſt diſtance.

It may be demonſtrated, that when the central air has for the ſecond time acquired the natural denſity, it will be at reſt, and be diſturbed no more; and that this will happen to all the ſhells in ſucceſſion. But the demonſtration is much too intricate for this place; we muſt be contented with pointing out a fact perfectly

336 Application of the fact of dropping a pebble into water.

analogous. When we drop a ſmall pebble into water, we ſee it produce a ſeries of circular waves, which go along the ſurface of ſmooth water to a great diſtance, becoming more and more gentle as they recede from the centre; and the middle, where the agitation was firſt produced, remains perfectly ſmooth, and this ſmoothneſs extends continually; that is, each wave when brought to a level remains at reſt. Now theſe waves are produced and propagated by the depreſſion and elevation made at the centre. The elevation tends to diffuſe itſelf; and the force with which each particle of water is actuated is a force acting directly up and down, and is proportional to the elevation or depreſſion of the particle. This hydroſtatical preſſure operates preciſely in the ſame way as the condenſation and rarefaction of the air; and the mathematical inveſtigation of the propagation of the circular undulations on ſmooth water is ſimilar in every ſtep to that of the propagation of the ſpherical waves in ſtill air. For this we appeal to Newton's *Principia*, or to Euler's *Opuſcula*, where he gives a very beautiful inveſtigation of the velocity of the aerial pulſes; and to ſome memoirs of de la Grange in the collections of the academies of Berlin and Turin. Theſe two laſt authors have made the inveſtigation as ſimple as ſeems poſſible, and have freed it from every objection which can be ſtated againſt the geometrical one of their great teacher Newton.

Having ſaid this much on the ſimilarity between the waves on water and the aerial undulations, we ſhall have recourſe to them, as affording us a very ſenſible object to repreſent many affections of the other which it would be extremely difficult to explain. We neither ſee nor feel the aerial undulations; and they behoved, therefore, to be deſcribed very abſtractedly and imperfectly. In the watery wave there is no permanent progreſſive motion of the water from the centre. Throw a ſmall bit of cork on the ſurface, and it will be obſerved to popple up and down without the leaſt motion outwards. In like manner, the particles of air are only agitated a very little outwards and inwards; which motion is communicated to the particles beyond them, while they themſelves come to reſt, unleſs agitated afreſh; and this agitation of the particles is inconceivably ſmall. Even the exploſion of a cannon at no great diſtance will but gently agitate a feather, giving it a ſingle impulſe outwards, and immediately after another inwards or towards the cannon. When a harpſichord wire is forcibly twanged at a few feet diſtance, the agitation of the air is next to inſenſible. It is not, however, nothing; and it differs from that in a watery wave by being *really* outwards and inwards. In conſequence of this, when the condenſed ſhell reaches an elaſtic body, it impels it ſlightly. If its elaſticity be ſuch as to make it acquire the oppoſite ſhape at the inſtant that the next agitation and condenſed ſhell of air touches it, its agitation will be doubled, and a third agitation will increaſe it, and ſo on, till it acquire the agitation competent to that of the ſhell of air which reaches it, and it is thrown into *ſenſible* vibration, and gives a ſound extremely faint indeed, becauſe the agitation which it acquires is that correſponding to a ſhell of air conſiderably removed from the original ſtring. Hence it happens that a muſical chord, pipe, or bell, will cauſe another to reſound, whoſe vibrations are iſochronous with its own; or if the vibrations of the one coincides with every ſecond, or third, or fourth, &c. of the other; juſt as we can put a very heavy pendulum into ſenſible motion by giving it a gentle puff with the breath at every vibration, or at every ſecond, third, or fourth, &c. A drum ſtruck in the neighbourhood of another drum will agitate it *very ſenſibly*; for here the ſtroke depreſſes a very conſiderable ſurface, and produces an agitation of a conſiderable maſs of air: it will even agitate the ſurface of ſtagnant water. The exploſion of a cannon will even break a neighbouring window. The ſhell of condenſed air which comes againſt the glaſs has a great ſurface and a great agitation: the beſt ſecurity in this caſe is to throw up the ſaſh; this admits the condenſed air into the room, which acts on the inſide of the window, balancing part of the external impulſe.

337 The waves of water are uſeful for explaining thoſe of air.

It is demonſtrated in every elementary treatiſe of natural philoſophy, that when a wave on water meets any plane obſtacle, it is reflected by it from a centre equally removed behind the obſtacle; that waves radiating from the focus of a parabola are reflected in waves perpendicular to its axis; that waves radiating from one focus of an ellipſe are made to converge to the other focus, &c. &c. All this may be affirmed of the aerial undulations; that when part of a wave gets through a hole in the obſtacle, it becomes the centre of a new ſeries of waves; that waves bend round the extremities

338 For waves of air and of water are in many reſpects very ſimilar.

of

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of an obſtacle: all this happens in the aerial undulations. And laſtly, that when the ſurface of water is thrown into regular undulations by one agitation, another agitation in another place will produce other regular waves, which will croſs the former without diſturbing them in the ſmalleſt degree. The ſame thing happens in air; and experiments may be made on water which will illuſtrate in the moſt perfect manner many other affections of the aerial pulſes, which we ſhould otherwiſe conceive very imperfectly. We would recommend to our curious readers to make ſome of theſe experiments in a large veſſel of milk. Take a long and narrow plate of lead, which, when ſet on the bottom of the veſſel, will reach above the ſurface of the milk; bend this plate into a parabola, elliptical or other curve. Make the undulations by dropping milk on the focus from a ſmall pipe, which will cauſe the agitations to ſucceed with rapidity, and then all that we have ſaid will be moſt diſtinctly ſeen, and the experiment will be very amuſing and inſtructive, eſpecially to the muſical reader.

339 Caution to the ſupporters of æthers, animal ſpirits, &c.

We would now requeſt all who make or read explanations of natural phenomena by means of vibrations of æthers, animal ſpirits, nervous fluids, &c. to fix their attention on the nature of the agitation in one of theſe undulations. Let him conſider whether this can produce the phenomenon, acting as any matter muſt act, by impulſe or by preſſure. If he ſees that it can produce the phenomenon, he will be able to point out the very motion it will produce, both in quantity and direction, in the ſame manner as Sir Iſaac Newton has pointed out all the irregularities of the moon's motion produced by the diſturbing force of the ſun. If he cannot do this, he fails in giving the firſt evidence of a mechanical explanation by the action of an elaſtic vibrating fluid. Let him then try to point out ſome palpable connection between the general phenomena of elaſtic undulations and the phenomenon in queſtion; this would ſhow an accompaniment to have at leaſt ſome probability. It is thus only we learn that the undulations of air produce ſound: we cannot tell how they affect the mechaniſm of the ear; but we ſee that the phenomena of ſound always accompany them, and that certain modifications of the one are regularly accompanied by certain modifications of the other. If we cannot do this neither, we have derived neither explanation nor illuſtration from the elaſtic fluid. And laſtly, let him remember that even if he ſhould be able to ſhow the competency of this fluid to the production of the phenomenon, the whole is ſtill an hypotheſis, becauſe we do not know that ſuch a fluid exiſts.

340 The folly of appealing to ſuch unknown ſubſtances.

We will venture to ſay, that whoever will proceed in this prudent manner will ſoon ſee the futility of moſt of the explanations of this kind which have been given. They are unfit for any but conſummate mathematicians; for they alone really underſtand the mechaniſm of aerial undulations, and even they ſpeak of them with heſitation as a thing but imperfectly underſtood. But even the unlearned in this ſcience can ſee the incompatibility of the hypotheſes with many things which they are brought to explain. To take an inſtance of the conveyance of ſenſation along the nerves; an elaſtic fluid is ſuppoſed to occupy them, and the undulations of this fluid are thought to be propagated along the nerves. Let us juſt think a little how the undulations would be conveyed along the ſurface of a canal which was completely filled up with reeds and bulruſhes, or let us make the experiment on ſuch a canal: we may reſt aſſured that the undulations in the one caſe will reſemble thoſe in the other; and we may ſee that in the canal there will be no regular or ſenſible propagation of the waves.

Air's Preſſure.

Let theſe obſervations have their influence, along with others which we have made on other occaſions, to wean our readers from this faſhionable proneneſs to introduce inviſible fluids and unknown vibrations into our phyſical diſcuſſions. They have done immenſe, and we fear irreparable, miſchief in ſcience; and there is but one phenomenon that has ever received any explanation by their means.

This may ſuffice for a looſe and popular account of aerial undulations; and with it we conclude our account of the motion, impulſe, and reſiſtance of air.

We ſhall now explain a number of natural appearances, depending on its preſſure and elaſticity, appearances not ſufficiently general, or too complicated for the purpoſes of argument, while we were employed in the inveſtigation of theſe properties, but too important to be paſſed over in ſilence.

341 The air's preſſure occaſions the coheſion of two ſurfaces accurately fitting each other;

It is owing to the preſſure of the atmoſphere that two ſurfaces which accurately fit each other cohere with ſuch force. This is a fact familiarly known to the glaſs-grinders, poliſhers of marble, &c. A large lenſe or ſpeculum, ground on its tool till it becomes very ſmooth, requires more than any man's ſtrength to ſeparate it directly from the tool. If the ſurface is only a ſquare inch, it will require 15 pounds to ſeparate them perpendicularly, though a very moderate force will make them ſlide along each other. But this coheſion is not obſerved unleſs the ſurfaces are wetted or ſmeared with oil or greaſe; otherwiſe the air gets between them, and they ſeparate without any trouble. That this coheſion is owing to the atmoſpheric preſſure, is evident from the eaſe with which the plates may be ſeparated in an exhauſted receiver.

342 and the adheſion of ſnails, &c. to rocks.

To the ſame cauſe we muſt aſcribe the very ſtrong adheſion of ſnails, periwinkles, limpets, and other univalve ſhells, to the rocks. The animal forms the rim of its ſhell, ſo as to fit the ſhape of the rock to which it intends to cling. It then fills its ſhell (if not already filled by its own body) with water. In this condition it is evident that we muſt act with a force equal to 15 pounds for every ſquare inch of touching ſurface before we can detach it. This may be illuſtrated by filling a drinking glaſs to the brim with water; and having covered it with a piece of thin wet leather, whelm it on a table, and then try to pull it ſtraight up; it will require a conſiderable force. But if we expoſe a ſnail adhering to a ſtone in the exhauſted receiver, we ſhall ſee it drop off by its own weight. In the ſame manner do the remora, the polypus, the lamprey, and many other animals, adhere with ſuch firmneſs. Boys frequently amuſe themſelves by pulling out large ſtones from the pavement by means of a circle of ſtiff wetted leather faſtened to a ſtring. It is owing to the ſame cauſe that the bivalve ſhell fiſhes keep themſelves ſo firmly ſhut. We think the muſcular force of an oyſter prodigious, becauſe it requires ſuch force to open it; but if we grind off a bit of the convex ſhell, ſo as to make a hole in it, though without hurting the fiſh in the ſmalleſt

Effects of Air's pressure. eſt degree, it opens with great eaſe, as it does alſo *in vacuo*.

343 Other effects of the air's preſſure. The preſſure of the air, operating in this way, contributes much to the coheſion of bodies, where we do not ſuſpect its influence. The tenacity of our mortars and cements would frequently be ineffectual without this aſſiſtance.

It is owing to the preſſure of the atmoſphere that a caſk will not run by the cock unleſs a hole be opened in ſome other part of the caſk. If the caſk is not quite full, ſome liquor indeed will run out, but it will ſtop as ſoon as the diminiſhed elaſticity of the air above the liquor is in equilibrio (together with the liquor) with the atmoſpheric preſſure. In like manner, a teapot muſt have a ſmall hole in its lid to enſure its pouring out the tea. If indeed the hole in the caſk is of large dimenſions, it will run without any other hole, becauſe air will get in at the upper ſide of the hole while the liquor runs out by the lower part of it.

On the ſame principle depends the performance of an inſtrument uſed by the ſpirit dealers for taking out a ſample of their ſpirits. It conſiſts of a long tinplate tube AB (fig. 74.), open a-top at A, and ending in a ſmall hole at B. The end B is dipped into the ſpirits, which riſes into the tube; then the thumb is clapt on the mouth A, and the whole is lifted out of the caſk. The ſpirit remains in it till the thumb be taken off; it is then allowed to run into a glaſs for examination. Plate ccccxxxi. fig. 74.

344 Why froſts inſtantly occaſion a ſcarcity of water. It ſeems principally owing to the preſſure of the air that froſts immediately occaſion a ſcantineſs of water in our fountains and wells. This is erroneouſly accounted for, by ſuppoſing that the water freezes in the bowels of the earth. But this is a great miſtake: the moſt intenſe froſt of a Siberian winter would not freeze the ground two feet deep; but a very moderate froſt will conſolidate the whole ſurface of a country, and make it impervious to the air; eſpecially if the froſt has been preceded by rain, which has ſoaked the ſurface. When this happens, the water which was filtering through the ground is all arreſted and kept ſuſpended in its capillary tubes by the preſſure of the air, in the very ſame manner as the ſpirits are kept ſuſpended in the inſtrument juſt now deſcribed by the thumb's ſhutting the hole A. A thaw melts the ſuperficial ice, and allows the water to run in the ſame manner as the ſpirits run when the thumb is removed.

345 The neceſſity of common air to animal life. Common air is neceſſary for ſupporting the lives of moſt animals. If a ſmall animal, ſuch as a mouſe or bird, be put under the receiver of an air-pump, and the air be exhauſted, the animal will quickly be thrown into convulſions and fall down dead; if the air be immediately readmitted, the animal will ſometimes revive, eſpecially if the rarefaction has been briſkly made, and has not been very great. We do not know that any breathing animal can bear the air to be reduced to one-fourth of its ordinary denſity, nor even one-third; nor have we good evidence that an animal will ever recover if the rarefaction is puſhed very far, although continued for a very ſhort time.

But the mere preſence of the air is by no means ſufficient for preſerving the life of the animal; for it is found, that an animal ſhut up in a veſſel of air cannot live in it for any length of time. If a man be ſhut up in a box, containing a wine hogſhead of air, he cannot live in it much above an hour, and long before this he will find his breathing very unſatisfactory and uneaſy. A gallon of air will ſupport him about a minute. A box EF (fig. 75.) may be made, having a pipe AB inſerted into its top, and fitted with a very light valve at B, opening upwards. This pipe ſends off a lateral branch *a* D *d* C, which enters the box at the bottom, and is alſo fitted with a light valve at C opening upwards. If a perſon breathe through the pipe, keeping his noſtrils ſhut, it is evident that the air which he expires will not enter the box by the hole B, nor return through the pipe CD *d*; and by this contrivance he will gradually employ the whole air of the box. With this apparatus experiments can be made without any riſk or inconveniency, and the quantity of air neceſſary for a given time of eaſy breathing may be accurately aſcertained. Effects of Air's preſſure. Fig. 75.

How the air of our atmoſphere produces this effect, is a queſtion which does not belong to mechanical philoſophy to inveſtigate or determine. We can, however affirm, that it is neither the preſſure nor the elaſticity of the air which is immediately concerned in maintaining the animal functions. We know that we can live and breathe with perfect freedom on the tops of the higheſt mountains. The valley of Quito in Peru, and the country round Gondar in Abyſſinia, are ſo far elevated above the ſurface of the ocean, that the preſſure and the elaſticity of the air are one-third leſs than in the low countries; yet theſe are populous and healthy places. And, on the other hand, we know, that when an animal has breathed in any quantity of air for a certain time without renewal, it will not only be ſuffocated, but another animal put into this air will die immediately; and we do not find either the preſſure or elaſticity of the air remarkably diminiſhed: it is indeed diminiſhed, but by a very ſmall quantity. Reſtoring the former preſſure and elaſticity has not the ſmalleſt tendency to prevent the death of the animal: for an animal will live no longer under a receiver that has its mouth inverted on water, than in one ſet upon the pump-plate covered with leather. Now when the receiver is ſet on water, the preſſure of the atmoſphere acts completely on the included air, and preſerves it in the ſame ſtate of elaſticity.

In ſhort, it is known that the air which has already ſerved to maintain the animal functions has its chemical and alimentary properties completely changed, and is no longer fit for this purpoſe. So much of any maſs of air as has really been thus employed is changed into what is called *fixed air* by Dr Black, or *carbonic acid* by the chemiſts of the Lavoiſierian ſchool. Any perſon may be convinced of this by breathing or blowing through a pipe immerſed in lime water. Every expiration will produce white clouds on the water, till all the lime which it contains is precipitated in the form of pure chalk. In this caſe we know that the lime has combined with the fixed air. 346 The nature of air when it has maintained animal functions is quite altered.

The celebrated Dr Stephen Hales made many experiments, with a view to clear the air from the noxious vapour which he ſuppoſed to be emitted from the lungs. 347 Hales's experiments to reſtore its former qualities, &c.

He made uſe of the apparatus which we have been juſt now mentioning; and he put ſeveral diaphragms *ff, ff*, &c. of thin woollen ſtuff into the box, and moiſtened them with various liquids. He found nothing ſo efficacious as a ſolution of potaſh. We now underſtand

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ftand this perfectly. If the folution is not already faturated with fixed air, it will take it up as faft as it is produced, and thus will purify the air: a folution of cauftic alkali therefore will have this effect till it is rendered quite mild.

348 How it comes to be changed by breathing, and the nature of infpiration, &c.

Thefe experiments have been repeated, and varied in many circumftances, in order to afcertain whether this fixed air was really emitted by the lungs, or whether the infpired air was in part changed into fixed air by its combination with fome other fubftance. This is a queftion which comes properly in our way, and which the doctrines of pneumatics enable us to anfwer. If the fixed air be emitted in fubftance from the lungs, it does not appear how a renewal of the air into which it is emitted is neceffary: for this does not hinder the fubfequent emiffion; and the bulk of the air would be increafed by breathing in it, viz. by the bulk of all the fixed air emitted; but, on the contrary, it is a little diminifhed. We muft therefore adopt the other opinion; and the difcoveries in modern chemiftry enable us to give a pretty accurate account of the whole procefs. Fixed air is acknowledged to be a compound, of which one ingredient is found to conftitute about three-eighths of the whole atmofpheric fluid; we mean vital air or the oxygen of Lavoifier. When this is combined with phlogifton, according to the doctrine of Stahl, or with charcoal, according to Lavoifier, the refult is fixed air or carbonic acid. The change therefore which breathing makes on the air is the folution of this matter by vital air; and the ufe of air in breathing is the carrying off this noxious principle in the way of folution. When therefore the air is already fo far faturated as not to diffolve this fubftance as faft as it is fecreted, or muft be fecreted in the lungs, the animal fuffers the pain of fuffocation, or is otherwife mortally affected. Suffocation is not the only confequence; for we can remain for a number of feconds without breathing, and then we begin to feel the true pain of fuffocation; but thofe who have been inftantaneoufly ftruck down by an infpiration of fixed air, and afterwards recovered to life, complained of no fuch pain, and feemed to have fuffered chiefly by a nervous affection. It is faid (but we will not vouch for the truth of it), that a perfon may fafely take a full infpiration of fixed air, if the paffages of the nofe be fhut; and that unlefs thefe nerves are ftimulated by the fixed air, it is not inftantaneoufly mortal. But thefe are queftions out of our prefent line of inquiry. They are queftions of phyfiology, and are treated of in other places of this work. See ANATOMY and PHYSIOLOGY; fee alfo LUNGS and RESPIRATION. Our bufinefs is to explain in what manner the preffure and elafticity of the air, combined with the ftructure and mechanifm of the body, operate in producing this neceffary fecretion and removal of the matter difcharged from the lungs in the act of breathing.

It is well afcertained, that the fecretion is made from the mafs of blood during its paffage through the lungs. The blood delivered into the lungs is of a dark blackifh colour, and is there changed into a florid red. In the lungs it is expofed to the action of the air in a prodigioufly extended furface: for the lungs confift of an inconceivable number of fmall veffels or bladders, communicating with each other and with the windpipe. Thefe are filled with air in every infpiration. Thefe veffels are every where in contact with minute blood-veffels. The blood does not *in toto* come into immediate contact with the air; and it would feem that it is only the thin ferous part of it which is acted on by the air at the mouths of the veffels or pores, where it ftands by capillary attraction. Dr Prieftley found, that venous blood inclofed in thin bladders and other membranes was rendered florid by keeping the bladders in contact with abundance of pure vital air. We know alfo, that breath is moift or damp, and *muft* have acquired this moifture in the lungs. It is immaterial whether this fecretion of water or lymph (as the anatomifts call it) be furnifhed by mere exudation through fimple pores, or by a vafcular and organic fecretion; in either cafe, fome ingredient of the blood comes in contact with air in the lungs, and there unites with it. This is farther confirmed, by obferving, that all breathing animals are warmer than the furrounding medium, and that by every procefs in which fixed air is formed from vital air heat is produced. Hence this folution in air of fomething from the blood has been affigned by many as the fource of animal heat. We touch on thefe things in a very tranfitory way in this place, only in order to prove that, for the fupport of animal life, there muft be a very extenfive application of air to the blood, and that this is made in the lungs.

The queftion before us in this place is, How is this brought about by the weight and elafticity of the air? This is done in two ways; by the action of the mufcles of the ribs, and by the action of the diaphragm and other mufcles of the abdomen. The thorax or cheft is a great cavity, completely filled by the lungs. The fides of this cavity are formed by the ribs. Thefe are crooked or arched, and each is moveable round its two ends, one of them being inferted into the vertebræ of the back, and the other into the fternum or breaft-bone. The rib turns in a manner refembling the handle of a drawer. The infpection of fig. 76. will illuftrate this matter a little. Fig. 76. Suppofe the curves *u c e*, *b k f*, *c l g*, &c. to reprefent the ribs moveable round the extremities. Each fucceeding rib is more bent than the one above it, and this curvature is both in the vertical and horizontal direction. Suppofe each fo broad as to project a little over its inferior like the tiles of a roof. It is evident, that if we take the lower one by its middle, and draw it out a little, moving it round the line *n p*, it will bring out the next *d m h* along with it. Alfo, becaufe the diftance of the middle point *o* from the axis of motion *n p* is greater than the diftance of *m* from the axis *d h*, and becaufe *o* will therefore defcribe a portion of a larger circle than *m* does, the rib *n o p* will flide up a little under the rib *d m h*, or the rib *d m h* will overlap *n o p* a little more than before; the diftance *o m* will therefore be diminifhed. The fame muft happen to all the fuperior ribs; but the change of diftance will be lefs and lefs as we go upwards. Now, inftead of this great breadth of the ribs overlapping each other, fuppofe each inferior rib connected with the one above it by threads or fibres fufceptible of contraction at the will of man. The articulations *e*, *a*, of the firft or upper rib with the fpine and fternum are fo broad and firm, that this rib can have little or no motion round the line *a e*; this rib therefore is as a fixture for the ends of all the contracting fibres: therefore, whenever the fibres which connect the fecond rib with the firft rib contract, the fecond muft rife a little, and alfo go outward, and will carry the lower ribs

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ribs along with it; the third rib will riſe ſtill farther by the contraction of the muſcles which connect it with the ſecond, and ſo on: and thus the whole ribs are raiſed and thrown outward (and a little forward, becauſe the articulation of each with the ſpine is conſiderably higher than that with the ſternum), and the capacity of the thorax is enlarged by the contraction of its muſcular covering. The direction of the muſcular fibres is very oblique to the direction of the circular motion which it produces; from which circumſtance it follows, that a very minute contraction of the muſcles produces all the motion which is neceſſary. This indeed is not great; the whole motion of the loweſt ribs is leſs than an inch in the moſt violent inſpiration, and the whole contraction of the muſcles of the twelve ribs does not exceed the eighth part of an inch, even ſuppoſing the intercoſtal muſcles at right angles to the ribs; and being oblique, the contraction is ſtill leſs (ſee BORELLI, SABATIER, MONRO, &c.). It would ſeem, that the intenſity of the contractive power of a muſcular fibre is eaſily obtained, but that the ſpace through which it can be exerted is very limited; for in moſt caſes nature places the muſcles in ſituations of great mechanical diſadvantage in this reſpect, in order to procure other conveniences.

But this is not the whole effect of the contraction of the intercoſtal muſcles: ſince the compound action of the two ſets of muſcles, which croſs each other from rib to rib like the letter X, is nearly at right angles to the rib, but is oblique to its plane, it tends to puſh the ribs cloſer on their articulations, and thus to preſs out the two pillars on which they are articulated. Thus, ſup-

Fig. 77.

poſing *a f* (fig. 77.) to repreſent the ſection of one of the vertebræ of the ſpine, and *c d* a ſection of the ſternum, and *a b e, f e d*, two oppoſite ribs, with a lax thread *b e* connecting them. If this thread be pulled upwards by the middle *g* till it is tight, it will tend to pull the points *b* and *e* nearer to each other, and to preſs the vertebra *a f* and the ſternum *c d* outwards. The ſpine being the chief pillar of the body, may be conſidered as immoveable in the preſent inſtance. The ſternum is ſufficiently ſuſceptible of motion for the preſent purpoſe. It remains almoſt fixed a-top at its articulation with the firſt rib, but it gradually yields below; and thus the capacity of the thorax is enlarged in this direction alſo. The whole enlargement of the diameters of the thorax during inſpiration is very ſmall, not exceeding the fiftieth part of an inch in ordinary caſes. This is eaſily calculated. Its quieſcent capacity is about two cubic feet, and we never draw in more than 15 inches. Two ſpheres, one of which holds 2 cubic feet and the other 2 feet and 15 inches, will not differ in diameter above the fiftieth part of an inch.

The other method of enlarging the capacity of the thorax is very different. It is ſeparated from the abdomen by a ſtrong muſcular partition called the *diaphragm*, which is attached to firm parts all around. In its quieſcent or relaxed ſtate it is conſiderably convex upwards, that is, towards the thorax, riſing up into its cavity like the bottom of an ordinary quart bottle, only not ſo regular in its ſhape. Many of its fibres tend from its middle to the circumference, where they are inſerted into firm parts of the body. Now ſuppoſe theſe fibres to contract. This muſt draw down its middle, or make it flatter than before, and thus enlarge the capacity of the thorax.

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Phyſiologiſts are not well agreed as to the ſhare which each of theſe actions has in the operation of enlarging the thorax. Many refuſe all ſhare of it to the intercoſtal muſcles, and ſay that it is performed by the diaphragm alone. But the fact is, that the ribs are really obſerved to riſe even while the perſon is aſleep; and this cannot poſſibly be produced by the diaphragm, as theſe anatomiſts aſſert. Such an opinion ſhows either ignorance or neglect of the laws of pneumatics. If the capacity of the thorax were enlarged only by drawing down the diaphragm, the preſſure of the air would compreſs the ribs, and make them deſcend. And the ſimple laws of mechanics make it as evident as any propoſition in geometry, that the contraction of the intercoſtal muſcles *muſt* produce an elevation of the ribs and enlargement of the thorax; and it is one of the moſt beautiful contrivances of nature. It depends much on the will of the animal what ſhare each of theſe actions ſhall have. In general, the greateſt part is done by the diaphragm; and any perſon can breathe in ſuch a manner that his rib ſhall remain motionleſs; and, on the contrary, he can breathe almoſt entirely by raiſing his cheſt. In the firſt method of breathing, the belly riſes during inſpiration, becauſe the contraction of the diaphragm compreſſes the upper part of the bowels, and therefore ſqueezes them outwards; ſo that an ignorant perſon would be apt to think that the breathing was performed by the belly, and that the belly is inflated with the air. The ſtrait lacing of the women impedes the motion of the ribs, and changes the natural habit of breathing, or brings on an unnatural habit. When the mind is depreſſed, it is obſerved that the breathing is more performed by the muſcles of the thorax; and a deep ſigh is always made in this way.

Theſe obſervations on the manner in which the capacity of the cheſt can be enlarged were neceſſary, before we can acquire a juſt notion of the way in which the mechanical properties of air operate in applying it to the maſs of blood during its paſſage through the lungs. Suppoſe the thorax quite empty, and communicating with the external air by means of the trachea or windpipe, it would then reſemble a pair of bellows. Raiſing the boards correſponds to the raiſing of the ribs; and we might imitate the action of the diaphragm by forcibly pulling outwards the folded leather which unites them. Thus their capacity is enlarged, and the air ruſhes in at the nozzle by its weight in the ſame manner as water would do. The thorax differs from bellows only in this reſpect, that it is filled by the lungs, which is a vaſt collection of little bladders, like the holes in a piece of fermented bread, all communicating with the trachea, and many of them with each other. When the cheſt is enlarged, the air ruſhes into them all in the ſame manner as into the ſingle cavity of an empty thorax. It cannot be ſaid with propriety that they are inflated: all that is done is the *allowing* the air to come in. At the ſame time, as their membranous covering muſt have ſome thickneſs, however ſmall, and ſome elaſticity, it is not unlikely that, when compreſſed by expiration, they tend a little to recover their former ſhape, and thus aid the voluntary action of the muſcles. It is in this manner that a ſmall bladder of caoutchouc

ſwells

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swells again after compression, and fills itself with air or water. But this cannot happen except in the most minute vesicles: those of sensible bulk have not elasticity enough for this purpose. The lungs of birds, however, have some very large bladders, which have a very considerable elasticity, and recover their shape and size with great force after compression, and thus fill themselves with air. The respiration of these animals is considerably different from that of land animals, and their muscles act chiefly in expiration. This will be explained by and-by as a curious variety in the pneumatic instrument.

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We take in air not by our own action, but by external pressure.

This account of the manner in which the lungs are filled with air does not seem agreeable to the notions we entertain of it. We seem to suck in the air; but although it be true that we act, and exert force, in order to get air into our lungs, it is not by our action, but by external pressure, that it does come in. If we apply our mouth to the top of a bottle filled with water, we find that no draught, as we call it, of our chest will suck in any of the water; but if we suck in the very same manner at the end of a pipe immersed in water, it follows immediately. Our interest in the thing makes us connect in imagination our own action with the effect, without thinking on the many steps which may intervene in the train of natural operations; and we consider the action as the immediate cause of the air's reception into the lungs. It is as if we opened the door, and took in by the hand a person who was really pushed in by the crowd without. If an incision be made into the side of the thorax, so that the air can get in by that way, when the animal acts in the usual manner, the air will really come in by this hole, and fill the space between the lungs and the thorax; but no air is sucked into the lungs by this process, and the animal is as completely suffocated as if the windpipe were shut up. And, on the other hand, if a hole be made into the lungs without communicating with the thorax, the animal will breathe through this hole, though the windpipe be stopped. This is successfully performed in cases of patients whose trachea is shut up by accident or by inflammation; only it is necessary that this perforation be made into a part of the lungs where it may meet with some of the great pulmonary passages: for if made into some remote part of a lobe, the air cannot find its way into the rest of the lungs through such narrow passages, obstructed too by blood, &c.

350
Nature of expiration.

We have now explained, on pneumatical principles, the process of inspiration. The expiration is chiefly performed by the natural tone of the parts. In the act of inspiration the ribs were raised and drawn outwards in opposition to the elasticity of the solids themselves; for although the ribs are articulated at their extremities, the articulations are by no means such as to give a free and easy motion like the joints of the limbs. This is particularly the case in the articulations with the sternum, which are by no means fitted for motion. It would seem that the motion really produced here is chiefly by the yielding of the cartilaginous parts and the bending of the rib; when therefore the muscles which produced this effect are allowed to relax, the ribs again collapse. Perhaps this is assisted a little by the action of the long muscles which come down across the ribs without being inserted into them. These may draw them together a little, as we compress a loose bundle by a string.

In like manner, when the diaphragm was drawn down, it compressed the abdomen in opposition to the elasticity of all the viscera contained in it, and to the elasticity and tone of the teguments and muscles which surround it. When therefore the diaphragm is relaxed, these parts push it up again into its natural situation, and in doing this expel the air from the lungs.

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It requires no effort.

If this be a just account of the matter, expiration should be performed without any effort. This accordingly is the case. We feel that, after having made an ordinary easy inspiration, it requires the continuance of the effort to keep the thorax in this enlarged state, and that all that is necessary for expiration is to cease to act. No person feels any difficulty in emptying the lungs; but weak people often feel a difficulty of inspiration, and compare it to the feeling of a weight on their breast; and expiration is the last motion of the thorax in a dying person.

But nature has also given us a mechanism by which we can expire, namely, the abdominal muscles; and when we have finished an ordinary and easy expiration, we can still expel a considerable bulk of air (nearly half of the contents of the lungs) by contracting the abdominal muscles. These, by compressing the body, force up its moveable contents against the diaphragm, and cause it to rise further into the thorax, acting in the same manner as when we expel the fæces *per anum*. When a person breathes out as much air as he can in this manner, he may observe that his ribs do not collapse during the whole operation.

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A certain quantity of air necessary to keep the lungs of a natural size.

There seems then to be a certain natural unconstrainest state of the vesicles of the lungs, and a certain quantity of air necessary for keeping them of this size. It is probable that this state of the lungs gives the freest motion to the blood. Were they more compressed, the blood vessels would be compressed by the adjoining vesicles; were they more lax, the vessels would be more crooked, and by this means obstructed. The frequent inspirations gradually change this air by mixing fresh air with it, and, at every expiration, carrying off some of it. In catarrhs and inflammations, especially when attended with suppuration, the small passages into the remote vessels are obstructed, and thus the renewal of air in them will be prevented. The painful feeling which this occasions causes us to expel the air with violence, shutting the windpipe, till we have exerted strongly with the abdominal muscles, and made a strong compression on the lower part of the thorax. We then open the passage suddenly, and expel the air and obstructing matter by violent coughing.

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Process of breathing in birds.

We have said, that birds exhibit a curious variety in the process of breathing. The muscles of their wings being so very great, required a very extensive insertion, and this is one use of the great breast-bone. Another use of it is, to form a firm partition to hinder the action of these muscles from compressing the thorax in the act of flying: therefore the form of their chest does not admit of alternate enlargement and contraction to that degree as in land animals. Moreover, the muscles of their abdomen are also very small; and it would seem that they are not sufficient for producing the compression on the bowels which is necessary for

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carrying on the proceſs of concoction and digeſtion. Inſtead of aiding the lungs, they receive help from them.

Fig. 78. In an oſtrich, the lungs conſiſt of a fleſhy part A, A (fig. 78.), compoſed of veſicles like thoſe of land animals, and, like theirs, ſerving to expoſe the blood to the action of the air. Beſides theſe, they have on each ſide four large bags B, C, D, E, each of which has an orifice G communicating with the trachea; but the ſecond, C, has alſo an orifice H, by which it communicates with another bag F ſituated below the reſt in the abdomen. Now, when the lungs are compreſſed by the action of the diaphragm, the air in C is partly expelled by the trachea through the orifice G, and partly driven through the orifice H into the bag F, which is then allowed to receive it; becauſe the ſame action which compreſſes the lungs enlarges the abdomen. When the thorax is enlarged, the bag C is partly ſupplied with freſh air through the trachea, and partly from the bag F. As the lungs of other animals reſemble a common bellows, the lungs of birds reſemble the ſmith's bellows with a partition; and anatomiſts have diſcovered paſſages from this part of the lungs into their hollow bones and quills. We do not know all the uſes of this contrivance; and only can obſerve, that this alternate action muſt aſſiſt the muſcles of the abdomen in promoting the motion of the food along the alimentary canal, &c. We can diſtinctly obſerve in birds that their belly dilates when the cheſt collapſes, and *vice verſa*, contrary to what we ſee in the land animals. Another uſe of this double paſſage may be to produce a circulation of air in the lungs, by which a compenſation is made for the ſmaller ſurface of action on the blood: for the number of ſmall veſicles, of equal capacity with theſe large bags, gives a much more extenſive ſurface.

If we try to raiſe mercury in a pipe by the action of the cheſt alone, we cannot raiſe it above two or three inches; and the attempt is both painful and hazardous. It is painful chiefly in the breaſt, and it provokes coughing. Probably the fluids ooze through the pores of the veſicles by the preſſure of the ſurrounding parts.

On the other hand, we can by expiration ſupport mercury about five or ſix inches high: but this alſo is very painful, and apt to produce extravaſation of blood. This ſeems to be done entirely by the abdominal muſcles.

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The operation of ſucking.

The operation properly termed SUCKING is totally different from breathing, and reſembles exceedingly the action of a common pump. Suppoſe a pipe held in the mouth, and its lower end immerſed in water. We fill the mouth with the tongue, bringing it forward, and applying it cloſely to the teeth and to the palate; we then draw it back, or bend it downwards (behind) from the palate, thus leaving a void. The preſſure of the air on the cheeks immediately depreſſes them, and applies them cloſe to the gums and teeth; and its preſſure on the water in the veſſel cauſes it to riſe through the pipe into the empty part of the mouth, which it quickly fills. We then puſh forward the tip of the tongue, below the water, to the teeth, and apply it to them all round, the water being above the tongue, which is kept much depreſſed. We then apply the tongue to the palate, beginning at the tip, and gradually going backwards in this application. By this means the water is gradually forced backward by an operation ſimilar to that of the gullet in ſwallowing. This is done by contracting the gullet above and relaxing it below, juſt as we would empty a gut of its contents by drawing our cloſed hand along it. By this operation the mouth is again completely occupied by the tongue, and we are ready for repeating the operation. Thus the mouth and tongue reſemble the barrel and piſton of a pump; and the application of the tip of the tongue to the teeth performs the office of the valve at the bottom of the barrel, preventing the return of the water into the pipe. Although uſual, it is not abſolutely neceſſary, to withdraw the tip of the tongue, making a void before the tongue. Sucking may be performed by merely ſeparating the tongue gradually from the palate, beginning at the root. If we withdraw the tip of the tongue a very minute quantity, the water gets in and flows back above the tongue.

The action of the tongue in this oper[illegible] is [illegible] powerful; ſome perſons can raiſe mercury 25 inches: but this ſtrong exertion is very fatiguing, and the ſoft parts are prodigiouſly ſwelled by it. It cauſes the blood to ooze plentifully through the pores of the tongue, fauces, and palate, in the ſame manner as if a cupping-glaſs and ſyringe were applied to them; and, when the inſide of the mouth is excoriated or tender, as is frequent with infants, even a very moderate exertion of this kind is accompanied with extravaſation of blood. When children ſuck the nurſe's breaſt, the milk follows their exertion by the preſſure of the air on the breaſt; and a weak child, or one that withholds its exertions on account of pain from the above-mentioned cauſe, may be aſſiſted by a gentle preſſure of the hand on the breaſt: the infant pupil of nature, without any knowledge of pneumatics, frequently helps itſelf by preſſing its face to the yielding breaſt.

In the whole of this operation the breathing is performed through the noſtrils; and it is a prodigious diſtreſs to an infant when this paſſage is obſtructed by mucus. We beg to be forgiven for obſerving by the way, that this obſtruction may be almoſt certainly removed for a little while, by rubbing the child's noſe with any liquid of quick evaporation, or even with water.

The operation in drinking is not very different from that in ſucking: we have indeed little occaſion here to ſuck, but we muſt do it a little. Dogs and ſome other animals cannot drink, but only lap the water into their mouths with their tongue, and then ſwallow it. The gallinaceous birds ſeem to drink very imperfectly; they ſeem merely to dip their head into the water up to the eyes till their mouth is filled with water, and then holding up the head, it gets into the gullet by its weight, and is then ſwallowed. The elephant drinks in a very complicated manner: he dips his trunk into the water, and fills it by making a void in his mouth: this he does in the contrary way to man. After having depreſſed his tongue, he begins the application of it to the palate at the root, and by extending the application forward, he expels the air by the mouth which came into it from the trunk. The proceſs here is not very unlike that of the condenſing ſyringe without a piſton valve, deſcribed in N° 58. in which the external air (correſponding here to the air in the trunk) enters by the hole F in the ſide, and is expelled through the hole in the end of the barrel; by this operation the trunk is filled with water; then he lifts his trunk out of the water, and bringing it to his mouth, pours the contents into it, and ſwallows it. On conſidering this operation, it appears that, by the

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and of drinking, which is very ſimilar.

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the ſame proceſs by which the air of the trunk is taken into the mouth, the water could alſo be taken in, to be afterwards ſwallowed: but we do not find, upon inquiry, that this is done by the elephant; we have always obſerved him to drink in the manner now deſcribed. In either way it is a double operation, and cannot be carried on any way but by alternately ſucking and ſwallowing, and while one operation is going on the other is interrupted; whereas man can do both at the ſame time. Nature ſeems to delight in exhibiting to rational obſervers her inexhauſtible variety of reſource; for many inſects, which drink with a trunk, drink without interruption: yet we do not call in queſtion the truth of the aphoriſm, *Natura maxime ſimplex et ſemper ſibi conſona*, nor doubt but that, if the *whole* of her purpoſe were ſeen, we ſhould find that her proceſs is the ſimpleſt poſſible: for Nature, or Nature's God, is wiſe above our wiſeſt thoughts, and ſimplicity is certainly the choice of wiſdom: but alas! it is generally but a ſmall and the moſt obvious part of her purpoſe that we can obſerve or appreciate. We ſeldom ſee this ſimplicity of nature ſtated to us, except by ſome ſyſtem-maker, who has found a principle which ſomehow tallies with a conſiderable variety of phenomena, and then cries out, *Fruſtra fit per plura quod fieri poteſt per pauciora.*

356 Mode of keeping up a continued blaſt with a blow-pipe.

There is an operation ſimilar to that of the elephant, which many find a great difficulty in acquiring, viz. keeping up a continued blaſt with a blow-pipe. We would deſire our chemical reader to attend minutely to the gradual action of his tongue in ſucking, and he will find it ſuch as we have deſcribed. Let him attend particularly to the way in which the tip of the tongue performs the office of a valve, preventing the return of the water into the pipe: the ſame poſition of the tongue would hinder air from coming into the mouth. Next let him obſerve, that in ſwallowing what water he has now got lodged above his tongue, he continues the tip of the tongue applied to the teeth; now let him ſhut his mouth, keeping his lips firm together, the tip of the tongue at the teeth, and the whole tongue forcibly kept at a diſtance from the palate; bring up the tongue to the palate, and allow the tip to ſeparate a little from the teeth, this will expel the air into the ſpace between the fauces and cheeks, and will blow up the cheeks a little: then, acting with the tip of the tongue as a valve, hinder this air from getting back, and depreſſing the tongue again, more air (from the noſtrils) will get into the mouth, which may be expelled into the ſpace without the teeth as before, and the cheeks will be more inflated: continue this operation, and the lips will no longer be able to retain it, and it will ooze through as long as the operation is continued. When this has become familiar and eaſy, take the blow-pipe, and there will be no difficulty in maintaining a blaſt as uniform as a ſmith's bellows, breathing all the while through the noſtrils. The only difficulty is the holding the pipe: this fatigues the lips; but it may be removed by giving the pipe a convenient ſhape, a pretty flat oval, and wrapping it round with leather or thread.

357 Nature of the land and ſea-breeze in warm countries.

Another phenomenon depending on the principles already eſtabliſhed, is the land and ſea-breeze in the warm countries.

We have ſeen that air expands exceedingly by heat; therefore heated air, being lighter than an equal bulk of cold air, muſt riſe in it. If we lay a hot ſtone in the ſunſhine in a room, we ſhall obſerve the ſhadow of the ſtone ſurrounded with a fluttering ſhadow of different degrees of brightneſs, and that this flutter riſes rapidly in a column above the ſtone. If we hold an extinguiſhed candle near the ſtone, we ſhall ſee the ſmoke move towards the ſtone, and then aſcend from it. Now, ſuppoſe an iſland receiving the firſt rays of the ſun in a perfectly calm morning; the ground will ſoon be warmed, and will warm the contiguous air. If the iſland be mountainous, this effect will be more remarkable; becauſe the inclined ſides of the hills will receive the light more directly: the midland air will therefore be moſt warmed: the heated air will riſe, and that in the middle will riſe faſteſt; and thus a current of air upwards will begin, which muſt be ſupplied by air coming in from all ſides, to be heated and to riſe in its turn; and thus the morning *ſea-breeze* is produced, and continues all day. This current will frequently be reverſed during the night, by the air cooling and gliding down the ſides of the hills, and we ſhall have the *land-breeze*.

358 Circulation of air in mines.

It is owing to the ſame cauſe that we have a circulation of air in mines which have the mouths of their ſhafts of unequal heights. The temperature under ground is pretty conſtant through the whole year, while that of the atmoſphere is extremely variable. Now, ſuppoſe a mine having a long horizontal drift, communicating between two pits or ſhafts, and that one of theſe ſhafts terminates in a valley, while the other opens on the brow of a hill perhaps 100 feet higher. Let us further ſuppoſe it ſummer, and the air heated to 65°, while the temperature of the earth is but 45°; this laſt will be alſo the temperature of the air in the ſhafts and the drift. Now, ſince air expands nearly 24 parts in 10,000 by one degree of heat, we ſhall have an odds of preſſure at the bottom of the two ſhafts equal to nearly the 20th part of the weight of a column of air 100 feet high (100 feet being ſuppoſed the difference of the heights of the ſhafts). This will be about ſix ounces on every ſquare foot of the ſection of the ſhaft. If this preſſure could be continued, it would produce a prodigious current of air down the long ſhafts, along the drift, and up the ſhort ſhaft. The weight of the air acting through 100 feet would communicate to it the velocity of 80 feet per ſecond: divide this by $\sqrt{20}$, that is, by 4.5, and we ſhall have 18 feet per ſecond for the velocity: this is the velocity of what is called a briſk gale. This preſſure *would* be continued, if the warm air which enters the long ſhaft were cooled and condenſed as faſt as it comes in; but this is not the caſe. *It is however cooled* and condenſed, and a current is produced ſufficient to make an abundant circulation of air along the whole paſſage; and care is taken to diſpoſe the ſhafts and conduct the paſſages in ſuch a manner that no part of the mine is out of the circle. When any new lateral drift is made, the renewal of air at its extremity becomes more imperfect as it advances: and when it is carried a certain length, the air ſtagnates and becomes ſuffocating, till either a communication can be made with the reſt of the mine, or a ſhaft be made at the end of this drift.

As this current depends entirely on the difference of temperature between the air below and that above, it muſt ceaſe when this difference ceaſes. Accordingly, in the ſpring and autumn, the miners complain much of ſtagnation; but in ſummer they never want a current from the deep pits to the ſhallow, nor in the winter

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a current from the ſhallow pits to the deep ones. It frequently happens alſo, that in mineral countries the chemical changes which are going on in different parts of the earth make differences of temperature ſufficient to produce a ſenſible current.

It is eaſy to ſee that the ſame cauſes muſt produce a current down our chimneys in ſummer. The chimney is colder than the ſummer air, and muſt therefore condenſe it, and it will come down and run out at the doors and windows.

359 The nature of what is called the draught in chimneys.

And this naturally leads us to conſider a very important effect of the expanſion and conſequent aſcent of air by heat, namely the drawing (as it is called) of chimneys. The air which has contributed to the burning of fuel muſt be intenſely heated, and will riſe in the atmoſphere. This will alſo be the caſe with much of the ſurrounding air which has come very near the fire, although not in contact with it. If this heated air be made to riſe in a pipe, it will be kept together, and therefore will not ſoon cool and collapſe: thus we ſhall obtain a long column of light air, which will riſe with a force ſo much the greater as the column is longer or more heated. Therefore the taller we make the chimney, or the hotter we make the fire, the more rapid will be the current, or the draught or ſuction, as it is injudiciouſly called, will be ſo much the greater. The aſcenſional force is the difference between the weight of the column of heated air in the funnel and a column of the ſurrounding atmoſphere of equal height. We increaſe the draught, therefore, by increaſing the perpendicular height of the chimney. Its length in a horizontal direction gives no increaſe, but, on the contrary, diminiſhes the draught by cooling the air before it gets into the effective part of the funnel. We increaſe the draught alſo by obliging all the air which enters the chimney to come very near the fuel; therefore a low mantle-piece will produce this effect; alſo filling up all the ſpaces on each ſide of the grate. When much air gets in above the fire, by having a lofty mantle-piece, the general maſs of air in the chimney cannot be much heated. Hence it muſt happen that the greateſt draught will be produced by bringing down the mantle-piece to the very fuel; but this converts a fire-place into a furnace, and by thus ſending the whole air through the fuel, cauſes it to burn with great rapidity, producing a prodigious heat; and this producing an increaſe of aſcenſional force, the current becomes furiouſly rapid, and the heat and conſumption of fuel immenſe. If the fire-place be a cube of a foot and a half, and the front cloſed by a door, ſo that all the air muſt enter through the bottom of the grate, a chimney of 15 or 20 feet high, and ſufficiently wide to give paſſage to all the expanded air which can paſs through the fire, will produce a current which will roar like thunder, and a heat ſufficient to run the whole inſide into a lump of glaſs.

All that is neceſſary, however, in a chamber fire-place, is a current ſufficiently great for carrying up the ſmoke and vitiated air of the fuel. And as we want alſo the enlivening flutter and light of the fire, we give the chimney-piece both a much greater height and width than what is merely neceſſary for carrying up the ſmoke, only wiſhing to have the current ſufficiently determinate and ſteady for counteracting any occaſional tendency which it may ſometimes have to come into the room. By allowing a greater quantity of air to get into the chimney, heated only to a moderate degree, we produce a more rapid renewal of the air of the room: did we oblige it to come ſo much nearer the fire as to produce the ſame renewal of the air in conſequence of a more rapid current, we ſhould produce an inconvenient heat. But in this country, where pit-coal is in general ſo very cheap, we carry this indulgence to an extreme; or rather we have not ſtudied how to get all the deſired advantages with economy. A much ſmaller renewal of air than we commonly produce is abundantly wholeſome and pleaſant, and we may have all the pleaſure of the light and flame of the fuel at much leſs expence, by contracting greatly the paſſage into the vent. The beſt way of doing this is by contracting the brick-work on each ſide behind the mantle-piece, and reducing it to a narrow parallelogram, having the back of the vent for one of its long ſides. Make an iron plate to fit this hole, of the ſame length, but broader, ſo that it may lie ſloping, its lower edge being in contact with the foreſide of the hole, and its upper edge leaning on the back of the vent. In this poſition it ſhuts the hole entirely. Now let the plate have a hinge along the front or lower edge, and fold up like the lid of a cheſt. We ſhall thus be able to enlarge the paſſage at pleaſure. In a fire-place fit for a room of 24 feet by 18, if this plate may be about 18 inches long from ſide to ſide, and folded back within an inch or an inch and a half of the wall, this will allow paſſage for as much air as will keep up a very cheerful fire: and by raiſing or lowering this REGISTER, the fire may be made to burn more or leſs rapidly. A free paſſage of half an inch will be ſufficient in weather that is not immoderately cold. The principle on which this conſtruction produces its effect is, that the air which is in the front of the fire, and much warmed by it, is not allowed to get into the chimney, where it would be immediately hurried up the vent, but riſes up to the ceiling and is diffuſed over the whole room. This double motion of the air may be diſtinctly obſerved by opening a little of the door and holding a candle in the way. If the candle be held near the floor, the flame will be blown into the room; but if held near the top of the door, the flame will be blown outward.

360 Deſcription of a ſtove-grate or chapelle.

But the moſt perfect method of warming an apartment in the temperate climates, where we can indulge in the cheerfulneſs and ſweet air produced by an open fire, is what we call a ſtove-grate, and our neighbours on the continent call a chapelle, from its reſemblance to the chapels or oratories in the great churches.

In the great chimney-piece, which, in this caſe, may be made even larger than ordinary, is ſet a ſmaller one fitted up in the ſame ſtyle of ornament, but of a ſize no greater than is ſufficient for holding the fuel. The ſides and back of it are made of iron (caſt iron is preferable to hammered iron, becauſe it does not ſo readily calcine), and are kept at a ſmall diſtance from the ſides and back of the main chimney-piece, and are continued down to the hearth, ſo that the aſh-pit is alſo ſeparated. The pipe or chimney of the ſtove grate is carried up behind the ornaments of the mantle-piece till it riſes above the mantle-piece of the main chimney-piece, and is fitted with a regiſter or damper-plate turning round a tranſverſe axis. The beſt form of this regiſter is that which we have recommended for an ordinary fire-place, having its axis or joint cloſe at the front; ſo that when it is open or turned up, the burnt air

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air and smoke striking it obliquely, are directed with certainty into the vent, without any risk of reverberating and coming out into the room. All the rest of the vent is shut up by iron plates or brick-work out of sight.

361 Effect of its construction.

The effect of this construction is very obvious. The fuel, being in immediate contact with the back and sides of the grate, heats them to a great degree, and they heat the air contiguous to them. This heated air cannot get up the vent, because the passages above these spaces are shut up. It therefore comes out into the room; some of it goes into the real fire-place and is carried up the vent, and the rest rises to the ceiling and is diffused over the room.

It is surprising to a person who does not consider it with skill how powerfully this grate warms a room. Less than one-fourth of the fuel consumed in an ordinary fire-place is sufficient; and this with the same cheerful blazing hearth and salutary renewal of air. It even requires attention to keep the room cool enough. The heat communicated to those parts in contact with the fuel is needlessly great; and it will be a considerable improvement to line this part with very thick plates of cast iron, or with tiles made of fire-clay which will not crack with the heat. These, being very bad conductors, will make the heat, ultimately communicated to the air, very moderate. If, with all these precautions, the heat should be found too great, it may be brought under perfect management by opening passages into the vent from the lateral spaces. These may be valves or trap-doors moved by rods concealed behind the ornaments.

Thus we have a fire-place under the most complete regulation, where we can always have a cheerful fire without being for a quarter of an hour incommoded by the heat; and we can as quickly raise our fire, when too low, by hanging on a plate of iron on the front, which shall reach as low as the grate. This in five minutes will blow up the fire into a glow: and the plate may be sent out of the room, or set behind the stove-grate out of sight.

The propriety of inclosing the ash-pit is not so obvious; but if this be not done, the light ashes, not finding a ready passage up the chimney, will come out into the room along with the heated air.

We do not consider in this place the various extraneous circumstances which impede the current of air in our chimneys and produce smoky houses: these will be treated of, and the methods of removing or remedying them, under the article SMOKE. We consider at present only the theory of this motion in general, and the modifications of its operation arising from the various purposes to which it may be applied.

362 Mode of warming apartments by stoves.

Under this head we shall next give a general account and description of the method of warming apartments by stoves. A STOVE in general is a fire-place shut up on all sides, having only a passage for admitting the air to support the fire, and a tube for carrying off the vitiated air and smoke; and the air of the room is warmed by coming into contact with the outside of the stove and flue. The general principle of construction, therefore, is very simple. The air must be made to come into as close contact as possible with the fire, or even to pass through it, and this in such quantities as just to consume a quantity of fuel sufficient for producing the heat required; and the stove must be so constructed, that both the burning fuel and the air which has been heated by it shall be applied to as extensive a surface as possible of furnace, all in contact with the air of the room; and the heated air within the stove must not be allowed to get into the funnel which is to carry it off till it is too much cooled to produce any considerable heat on the outside of the stove.

In this temperate climate no great ingenuity is necessary for warming an ordinary apartment; and stoves are made rather to please the eye as furniture than as economical substitutes for an open fire of equal calorific power. But our neighbours on the continent, and especially towards the north, where the cold of winter is intense and fuel very dear, have bestowed much attention on their construction, and have combined ingenious economy with every elegance of form. Nothing can be handsomer than the stoves of Fayencerie that are to be seen in French Flanders, or the Russian stoves at St Petersburgh, finished in stucco. Our readers will not, therefore, be displeased with a description of them. In this place, however, we shall only consider a stove in general as a subject of pneumatical discussion, and we refer our readers to the article STOVE for an account of them as articles of domestic accommodation.

363 General form of a stove.

The general form, therefore, of a stove, and of which all others are only modifications adapted to circumstances of utility or taste, is as follows:

Fig. 79.

MIKL (fig. 79.) is a quadrangular box of any size in the directions MILK. The inside width from front to back is pretty constant, never less than ten inches, and rarely extending to 20; the included space is divided by a great many partitions. The lowest chamber AB is the receptacle for the fuel, which lies on the bottom of the stove without any grate; this fire-place has a door AO turning on hinges, and in this door is a very small wicket P: the roof of the fire-place extends to within a very few inches of the farther end, leaving a narrow passage B for the flame. The next partition *c* C is about eight inches higher, and reaches almost to the other end, leaving a narrow passage for the flame at C. The partitions are repeated above, at the distance of eight inches, leaving passages at the ends, alternately disposed as in the figure; the last of them H communicates with the room vent. This communication may be regulated by a plate of iron, which can be slid across it by means of a rod or handle which comes through the side. The more usual way of shutting up this passage is by a sort of pan or bowl of earthen ware, which is whelmed over it with its brim resting in sand contained in a groove formed all round the hole. This damper is introduced by a door in the front, which is then shut. The whole is set on low pillars, so that its bottom may be a few inches from the floor of the room: it is usually placed in a corner, and the apartments are so disposed that their chimneys can be joined in stacks as with us.

Some straw or wood-shavings are first burnt on the hearth at its farther end. This warms the air in the stove, and creates a determined current. The fuel is then laid on the hearth close by the door, and pretty much piled up. It is now kindled; and the current being already directed to the vent, there is no danger of any smoke coming out into the room. Effectually to prevent this, the door is shut, and the wicket P opened,

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ed. The air supplied by this, being directed to the middle or bottom of the fuel, quickly kindles it, and the operation goes on.

364 Aim and effects of this construction.

The aim of this construction is very obvious. The flame and heated air are retained as long as possible within the body of the stove by means of the long passages; and the narrowness of these passages obliges the flame to come in contact with every particle of soot, so as to consume it completely, and thus convert the whole combustible matter of the fuel into heat. For want of this a very considerable portion of our fuel is wasted by our open fires, even under the very best management: the soot which sticks to our vents is very inflammable, and a pound weight of it will give as much if not more heat than a pound of coal. And what sticks to our vents is very inconsiderable in comparison with what escapes unconsumed at the chimney top. In fires of green wood, peat, and some kinds of pit-coal, nearly one-fifth of the fuel is lost in this way; but in these stoves there is hardly ever any mark of soot to be seen; and even this small quantity is produced only after lighting the fires. The volatile inflammable matters are expelled from parts much heated indeed, but not so hot as to burn; and some of it charred or half burnt cannot be any further consumed, being enveloped in flame and air already vitiated and unfit for combustion. But when the stove is well heated, and the current brisk, no part of the soot escapes the action of the air.

The hot air retained in this manner in the body of the stove is applied to its sides in a very extended surface. To increase this still more, the stove is made narrower from front to back in its upper part; a certain breadth is necessary below, that there may be room for fuel. If this breadth were preserved all the way up, much heat would be lost, because the heat communicated to the partitions of the stove does no good. By diminishing their breadth, the proportion of useful surface is increased. The whole body of the stove may be considered as a long pipe folded up, and its effect would be the greatest possible if it really were so; that is, if each partition *c* C, *d* D, &c. were split into two, and a free passage allowed between them for the air of the room. Something like this will be observed afterwards in some German stoves.

It is with the same view of making an extensive application of a hot surface to the air, that the stove is not built in the wall, not even in contact with it, nor with the floor: for by its detached situation, the air in contact with the back, and with the bottom (where it is hottest), is warmed, and contributes at least one half of the whole effect; for the great heat of the bottom makes its effect on the air of the room at least equal to that of the two ends. Sometimes a stove makes part of the wall between two small rooms, and is found sufficient.

It must be remarked, on the whole, that the effect of a stove depends much on keeping in the room the air already heated by it. This is so remarkably the case, that a small open fire in the same room will be so far from increasing its heat, that it will greatly diminish it: it will even draw the warm air from a suite of adjoining apartments. This is distinctly observed in the houses of the English merchants in St Petersburgh: their habits of life in Britain make them uneasy without an open fire in their sitting rooms; and this obliges them to heat all their stoves twice a-day, and their houses are cooler than those of the Russians who heat them only once. In many German houses, especially of the lower class, the fire-place of the stove does not open into the room, but into the yard or a lobby, where all the fires are lighted and tended; by this means is avoided the expence of warm air which must have been carried off by the stove: but it is evident that this must be very unpleasant, and cannot be wholesome. We must breathe the same quantity of stagnant air loaded with all the vapours and exhalations which must be produced in every inhabited place. Going into one of these houses from the open air, is like putting one's head into a stew-pan or under a pie-crust, and quickly nauseates us who are accustomed to fresh air and cleanliness. In these countries it is a matter almost of necessity to fumigate the rooms with frankincense and other gums burnt. The censer in ancient worship was in all probability an utensil introduced by necessity for sweetening or rendering tolerable the air of a crowded place: and it is a constant practice in the Russian houses for a servant to go round the room after dinner, waving a censer with some gums burning on bits of charcoal.

365 Of hot walls in gardening, &c.

The account now given of stoves for heating rooms, and of the circumstances which must be attended to in their construction, will equally apply to hot walls in gardening, whether within or without doors. The only new circumstance which this employment of a flue introduces, is the attention which must be paid to the equability of the heat, and the gradation which must be observed in different parts of the building. The heat in the flue gradually diminishes as it recedes from the fire-place, because it is continually giving out heat to the flue. It must therefore be so conducted through the building by frequent returns, that in every part there may be a mixture of warmer and cooler branches of the flue, and the final chimney should be close by the fire-place. It would, however, be improper to run the flue from the end of the floor up to the ceiling, where the second horizontal pipe would be placed, and then return it downward again and make the third horizontal flue adjoining to the first, &c. This would make the middle of the wall the coldest. If it is the flue of a greenhouse, this would be highly improper, because the upper part of the wall can be very little employed; and in this case it is better to allow the flue to proceed gradually up the wall in its different returns, by which the lowest part would be the warmest, and the heated air will ascend among the pots and plants; but in a hot wall, where the trees are to receive heat by contact, some approximation to the above method may be useful.

In the hypocausta and sudaria of the Greeks and Romans, the flue was conducted chiefly under the floors.

366 Malt-kilns a species of stove.

Malt-kilns are a species of stove which merit our attention. Many attempts have been made to improve them on the principle of flue stoves; but they have been unsuccessful, because heat is not what is chiefly wanted in malting: it is a copious current of very dry air to carry off the moisture. We must refer the examination of this subject also to the article STOVE, and proceed to consider the current of heated air in the chief varieties of furnaces.

367 Of the current of air in melting furnaces.

All that is to be attended to in the different kinds of melting furnaces is, that the current of air be sufficiently rapid, and that it be applied in as extensive a surface as possible

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poſſible to the ſubſtance to be melted. The more rapid the current it is the hotter, becauſe it is conſuming more fuel; and therefore its effect increaſes in a higher proportion than its rapidity. It is doubly effectual if twice as hot; and if it then be twice as rapid, there is twice the quantity of doubly hot air applied to the ſubject; it would therefore be four times more powerful. This is procured by raiſing the chimney of the furnace to a greater height. The cloſe application of it to the ſubject can hardly be laid down in general terms, becauſe it depends on the preciſe circumſtances of each caſe.

368 In reverberatory furnaces,

In reverberatory furnaces, ſuch as refining furnaces for gold, ſilver, and copper, the flame is made to play over the ſurface of the melted metal. This is produced entirely by the form of the furnace, by making the arch of the furnace as long as the circumſtances of the manipulation will allow. See FURNACE. Experience has pointed out in general the chief circumſtances of their conſtruction, viz. that the fuel ſhould be at one end on a grate, through which the air enters to maintain the fire; and that the metal ſhould be placed on a level floor between the fuel and the tall chimney which produces the current. But there is no kind of furnace more variable in its effect, and almoſt every place has a ſmall peculiarity of conſtruction, on which its pre-eminence is reſted. This has occaſioned many whimſical varieties in their form. This uncertainty ſeems to depend much on a circumſtance rather foreign to our preſent purpoſe; but as we do not obſerve it taken notice of by mineralogical writers, we beg leave to mention it here. It is not heat alone that is wanted in the refining of ſilver by lead, for inſtance. We muſt make a continual application to its ſurface of air, which has not contributed to the combuſtion of the fuel. Any quantity of the hotteſt air, already ſaturated with the fuel, may play on the ſurface of the metal for ever, and keep it in the ſtate of moſt perfect fuſion, but without refining it in the leaſt. Now, in the ordinary conſtruction of a furnace, this is much the caſe. If the whole air has come in by the grate, and paſſed through the middle of the fuel, it can hardly be otherwiſe than nearly ſaturated with it; and if air be alſo admitted by the door (which is generally done or ſomething equivalent), the pure air lies above the vitiated air, and during the paſſage along the horizontal part of the furnace, and along the ſurface of the metal, it ſtill keeps above it, at leaſt there is nothing to promote their mixture. Thus the metal does not come into contact with air fit to act on the baſe metal and calcine it, and the operation of refining goes on ſlowly. Trifling circumſtances in the form of the arch or canal may tend to promote the jumbling of the airs together, and thus render the operation more expeditious; and as theſe are but ill underſtood, or perhaps this circumſtance not attended to, no wonder that we ſee theſe conſidered as ſo many noſtrums of great importance. It were therefore worth while to try the effect of changes in the form of the roof directed to this very circumſtance. Perhaps ſome little prominence down from the arch of the reverberatory would have this effect, by ſuddenly throwing the current into confuſion. If the additional length of paſſage do not cool the air too much, we ſhould think that if there were interpoſed between the fuel and the refining floor a paſſage twiſted like a cork-ſcrew, making juſt half a turn, it would be moſt effectual: for we imagine, that the two airs, keeping each to their reſpective ſides of the paſſage, would by this means be turned upſide down, and that the pure ſtratum would now be in contact with the metal, and the vitiated air would be above it.

369 and in the glaſshouſe furnaces.

The glaſshouſe furnace exhibits the chief variety in the management of the current of heated air. In this it is neceſſary that the hole at which the workman dips his pipe into the pot ſhall be as hot as any part of the furnace. This could never be the caſe, if the furnace had a chimney ſituated in a part above the dipping-hole; for in this caſe cold air would immediately ruſh in at the hole, play over the ſurface of the pot, and go up the chimney. To prevent this the hole itſelf is made the chimney; but as this would be too ſhort, and would produce very little current and very little heat, the whole furnace is ſet under a tall dome. Thus the heated air from the real furnace is confined in this dome, and conſtitutes a high column of very light air, which will therefore riſe with great force up the dome, and eſcape at the top. The dome is therefore the chimney, and will produce a draught or current proportioned to its height. Some are raiſed above a hundred feet. When all the doors of this houſe are ſhut, and thus no ſupply given except through the fire, the current and heat become prodigious. This, however, cannot be done, becauſe the workmen are in this chimney, and muſt have reſpirable air. But notwithſtanding this ſupply by the houſe-doors, the draught of the real furnace is vaſtly increaſed by the dome, and a heat produced ſufficient for the work, and which could not have been produced without the dome.

370 Improvement of Mr Cotterel for melting iron from the ore.

This has been applied with great ingenuity and effect to a furnace for melting iron from the ore, and an iron finery, both without a blaſt. The common blaſt iron furnace is well known. It is a tall cone with the apex undermoſt. The ore and fluxes are thrown into this cone mixed intimately with the fuel till it is full, and the blaſt of moſt powerful bellows is directed into the bottom of this cone through a hole in the ſide. The air is thrown in with ſuch force, that it makes its way through the maſs of matter, kindles the fuel in its paſſage, and fluxes the materials, which then drop down into a receptacle below the blaſt-hole, and thus the paſſage for the air is kept unobſtructed. It was thought impoſſible to produce or maintain this current without bellows; but Mr Cotterel, an ingenious founder, tried the effect of a tall dome placed over the mouth of the furnace, and though it was not half the height of many glaſshouſe domes it had the deſired effect. Conſiderable difficulties, however, occurred; and he had not ſurmounted them all when he left the neighbourhood of Edinburgh, nor have we ſince heard that he has brought the invention to perfection. It is extremely difficult to place the holes below, at which the air is to enter, at ſuch a preciſe height as neither to be choked by the melted matter, nor to leave ore and ſtones below them unmelted; but the invention is very ingenious, and will be of immenſe ſervice if it can be perfected; for in many places iron ore is to be found where water cannot be had for working a blaſt furnace.

The laſt application which we ſhall make of the cur-

rents

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rents produced by heating the air is to the freeing mines, ſhips, priſons, &c. from the damp and noxious vapours which frequently infeſt them.

371 Currents of air applied to free mines, ſhips, priſons, &c. of noxious air.

As a drift or work is carried on in the mine, let a trunk of deal boards, about 6 or 8 inches ſquare, be laid along the bottom of the drift, communicating with a trunk carried up in the corner of one of the ſhafts. Let the top of this laſt trunk open into the aſh-pit of a ſmall furnace, having a tall chimney. Let fire be kindled in the furnace; and when it is well heated, ſhut the fire-place and aſh-pit doors. There being no other ſupply for the current produced in the chimney of this furnace, the air will flow into it from the trunk, and will bring along with it all the offenſive vapours. This is the moſt effectual method yet found out. In the ſame manner may trunks be conducted into the aſh-pit of a furnace from the cells of a priſon or the wards of an hoſpital.

372 Air neceſſary for the combuſtion of fuel.

In the account which we have been giving of the management of air in furnaces and common fires, we have frequently mentioned the immediate application of air to the burning fuel as neceſſary for its combuſtion. This is a general fact. In order that any inflammable body may be really inflamed, and its combuſtible matter conſumed and aſhes produced, it is not enough that the body be made hot. A piece of charcoal incloſed in a box of iron may be kept red hot for ever, without waſting its ſubſtance in the ſmalleſt degree. It is farther neceſſary that it be in contact with a particular ſpecies of air, which conſtitutes about three-fourths of the air of the atmoſphere, viz. the vital air or oxygen of Lavoiſier. It was called *empyreal air* by Scheele, who firſt obſerved its indiſpenſable uſe in maintaining fire: and it appears, that, in contributing to the combuſtion of an inflammable body, this air combines with ſome of its ingredients, and becomes fixed air, ſuffering the ſame change as by the breathing of animals. Combuſtion may therefore be conſidered as a ſolution of the inflammable body in air. This doctrine was firſt promulgated by the celebrated Dr Hooke in his *Micrographia*, publiſhed in 1660, and afterwards improved in his treatiſe on Lamps. It is now completely eſtabliſhed, and conſidered as a new diſcovery. It is for this reaſon, that in fire-places of all kinds we have directed the conſtruction, ſo as to produce a cloſe application of the air to the fuel. It is quite needleſs at this day to enter into the diſcuſſions which formerly occupied philoſophers about the manner in which the preſſure and elaſticity of the air promoted combuſtion. Many experiments were made in the 17th century by the firſt members of the Royal Society, to diſcover the office of air in combuſtion. It was thought that the flame was extinguiſhed in rare air for want of a preſſure to keep it together; but this did not explain its extinction when the air was not renewed. Theſe experiments are ſtill retained in courſes of experimental philoſophy, as they are judiciouſly ſtyled; but they give little or no information, nor tend to the illuſtration of any pneumatical doctrine; they are therefore omitted in this place. In ſhort, it is now fully eſtabliſhed, that it is not a mechanical but a chemical phenomenon. We can only inform the chemiſt, that a candle will conſume faſter in the low countries than in the elevated regions of Quito and Gondar, becauſe the air is nearly one half denſer below, and will act proportionally faſter in decompoſing the candle.

Pneumatic Engines.

We ſhall conclude this part of our ſubject with the explanation of a curious phenomenon obſerved in many places. Certain ſprings or fountains are obſerved to have periods of repletion and ſcantineſs, or ſeem to ebb and flow at regular intervals; and ſome of theſe periods are of a complicated nature. Thus a well will have ſeveral returns of high and low water, the difference of which gradually increaſes to a maximum, and then diminiſhes, juſt as we obſerve in the ocean. A very ingenious and probable explanation of this has been given in N° 424. of the Philoſophical Tranſactions, by Mr Atwell, as follows.

373 Curious effect of the air's preſſure.

Let ABCD (fig. 80.) repreſent a cavern, into which water is brought by the ſubterraneous paſſage OT. Let it have an outlet MNP, of a crooked form, with its higheſt part N conſiderably raiſed above the bottom of the cavern, and thence ſloping downwards into lower ground, and terminating in an open well at P. Let the dimenſions of this canal be ſuch that it will diſcharge much more water than is ſupplied by TO. All this is very natural, and may be very common. The effect of this arrangement will be a remitting ſpring at P: for when the cavern is filled higher than the point N, the canal MNP will act as a ſyphon; and, by the conditions aſſumed, it will diſcharge the water faſter than TO ſupplies it; it will therefore run it dry, and then the ſpring at P will ceaſe to furniſh water. After ſome time the cavern will again be filled up to the height N, and the flow at P will recommence. Fig. 80.

If, beſides this ſupply, the well P alſo receive water from a conſtant ſource, we ſhall have a reciprocating ſpring.

The ſituation and dimenſions of this ſyphon canal, and the ſupply of the feeder, may be ſuch, that the efflux at P will be conſtant. If the ſupply increaſe in a certain degree, a reciprocation will be produced at P with very ſhort intervals; if the ſupply diminiſhes conſiderably, we ſhall have another kind of reciprocation with great intervals and great differences of water.

If the cavern have another ſimple outlet R, new varieties will be produced in the ſpring P, and R will afford a copious ſpring. Let the mouth of R, by which the water enters into it from the cavern, be lower than N, and let the ſupply of the feeding ſpring be no greater than R can diſcharge, we ſhall have a conſtant ſpring from R, and P will give no water. But ſuppoſe that the main feeder increaſes in winter or in rainy ſeaſons, but not ſo much as will ſupply both P and R, the cavern will fill till the water gets over N, and R will be running all the while; but ſoon after P has begun to flow, and the water in the cavern ſinks below R, the ſtream from R will ſtop. The cavern will be emptied by the ſyphon canal MNP, and then P will ſtop. The cavern will then begin to fill, and when near full R will give a little water, and ſoon after P will run and R ſtop as before, &c.

Deſaguliers ſhows, vol. ii. p. 177, &c. in what manner a prodigious variety of periodical ebbs and flows may be produced by underground canals, which are extremely ſimple and probable.

374 Account of ſome pneumatic engines.

We ſhall conclude this article with the deſcriptions of ſome pneumatical machines or engines which have not been particularly noticed under their names in the former volumes of this work.

Pneumatic Engines.

Bellows are of most extensive and important use; and it will be of service to describe such as are of uncommon construction and great power, fit for the great operations in metallurgy.

It is not the impulsive force of the blast that is wanted in most cases, but merely the copious supply of air, to produce the rapid combustion of inflammable matter; and the service would be better performed in general if this could be done with moderate velocities, and an extended surface. What are called air-furnaces, where a considerable surface of inflammable matter is acted on at once by the current which the mere heat of the expended air has produced, are found more operative in proportion to the air expended than blast furnaces animated by bellows; and we doubt not but that the method proposed by Mr Cotterel (which we have already mentioned) of increasing this current in a melting furnace by means of a dome, will in time supersede the blast furnaces. There is indeed a great impulsive force required in some cases; as for blowing off the scoriæ from the surface of silver or copper in refining furnaces, or for keeping a clear passage for the air in the great iron furnace.

In general, however, we cannot procure this abundant supply of air any other way than by giving it a great velocity by means of a great pressure, so that the general construction of bellows is pretty much the same in all kinds. The air is admitted into a very large cavity, and then expelled from it through a small hole.

The furnaces at the mines having been greatly enlarged, it was necessary to enlarge the bellows also: and the leathern bellows becoming exceedingly expensive, wooden ones were substituted in Germany about the beginning of the 17th century, and from them became general through Europe. They consist of a wooden box ABCPFE (fig. 92.), which has its top and two sides flat or straight, and the end BAE *e* formed into an arched or cylindrical surface, of which the line FP at the other end is the axis. This box is open below, and receives within it the shallow box KHGNML (fig. 93.), which exactly fills it. The line FP of the one coincides with FP of the other, and along this line is a set of hinges on which the upper box turns as it rises and sinks. The lower box is made fast to a frame fixed in the ground. A pipe OQ proceeds from the end of it, and terminates at the furnace, where it ends in a small pipe called the *tewer* or *tuyere*. This lower box is open above, and has in its bottom two large valves V, V, fig. 94. opening inwards. The conducting pipe is sometimes furnished with a valve opening outwards, to prevent burning coals from being sucked into the bellows when the upper box is drawn up. The joint along PF is made tight by thin leather nailed along it. The sides and ends of the fixed box are made to fit the sides and curved end of the upper box, so that this last can be raised and lowered round the joint FP without sensible friction, and yet without suffering much air to escape: but as this would not be sufficiently air-tight by reason of the shrinking and warping of the wood, a farther contrivance is adopted. A slender lath of wood, divided into several joints, and covered on the outer edge with very soft leather, is laid along the upper edges of the sides and ends of the lower box. This lath is so broad, that when its inner edge is even with the inside of the box, its outer edge projects about an inch. It is kept in this position by a number of steel wires, which are driven into the bottom of the box, and stand up touching the sides, as represented in fig. 95. where *a b c* are the wires, and *e* the lath, projecting over the outside of the box. By this contrivance the laths are pressed close to the sides and curved end of the moveable box, and the spring wires yield to all their inequalities. A bar of wood RS (fig. 92.) is fixed to the upper board, by which it is either raised by machinery, to sink again by its own weight, having an additional load laid on it, or it is forced downward by a crank or wiper of the machinery, and afterwards raised.

Plate CCCCXXXII. fig. 92.

Fig. 93.

Fig. 94.

Fig. 95.

Fig. 92.

The operation here is precisely similar to that of blowing with a chamber-bellows. When the board is lifted up, the air enters by the valves V, V, fig. 94. and is expelled at the pipe OQ by depressing the boards. There is therefore no occasion to insist on this point.

These bellows are made of a very great size, AD being 16 feet, AB five feet, and the circular end AE also five feet. The rise, however, is but about 3 or $3\frac{1}{2}$ feet. They expel at each stroke about 90 cubic feet of air, and they make about 8 strokes per minute.

Such are the bellows in general use on the continent. We have adopted a different form in this kingdom, which seems much preferable. We use an iron or wooden cylinder, with a piston sliding along it. This may be made with much greater accuracy than the wooden boxes, at less expence, if of wood, because it may be of coopers work, held together by hoops; but the great advantage of this form is its being more easily made air-tight. The piston is surrounded with a broad strap of thick and soft leather, and it has around its edge a deep groove, in which is lodged a quantity of wool. This is called the packing or stuffing, and keeps the leather very closely applied to the inner surface of the cylinder. Iron cylinders may be very neatly bored and smoothed, so that the piston, even when very tight, will slide along it very smoothly. To promote this, a quantity of black lead is ground very fine with water, and a little of this is smeared on the inside of the cylinder from time to time.

The cylinder has a large valve, or sometimes two, in the bottom, by which the atmospheric air enters when the piston is drawn up. When the piston is thrust down, this air is expelled along a pipe of great diameter, which terminates in the furnace with a small orifice.

This is the simplest form of bellows which can be conceived. It differs in nothing but size from the bellows used by the rudest nations. The Chinese smiths have a bellows very similar, being a square pipe of wood ABCDE (fig. 96.), with a square board G which exactly fits it, moved by the handle FG. At the farther end is the blast pipe HK, and on each side of it a valve in the end of the square pipe, opening inwards. The piston is sufficiently tight for their purposes without any leathering.

Fig. 96.

The piston of this cylinder bellows is moved by machinery. In some blast engines the piston is simply raised by the machine, and then let go, and it descends by its own weight, and compresses the air below it to such a degree, that the velocity of efflux becomes constant, and the piston descends uniformly: for this purpose it must be loaded with a proper weight. This produces a very uniform blast, except at the very beginning, while the piston falls suddenly and compresses the air: but in most engines the piston rod is forced down the

Pneumatic Engines.

the cylinder with a determined motion, by means of a beam, crank, or other contrivance. This gives a more unequal blaſt, becauſe the motion of the piſton is neceſſarily ſlow in the beginning and end of the ſtroke, and quicker in the middle.

But in all it is plain that the blaſt muſt be deſultory. It ceaſes while the piſton is riſing; for this reaſon it is uſual to have two cylinders, as it was formerly uſual to have two bellows, which worked alternately. Sometimes three or four are uſed, as at the Carron iron works. This makes a blaſt abundantly uniform.

But an uniform blaſt may be made with a ſingle cylinder, by making it deliver its air into another cylinder, which has a piſton exactly fitted to its bore, and loaded with a ſufficient weight. The blowing cylinder
Fig. 97. ABCD (fig. 97.) has its piſton P worked by a rod NP, connected by double chains with the arched head of the working beam NO, moving round a gudgeon at R. The other end O of this beam is connected by the rod OP, with the crank PQ of a wheel machine; or it may be connected with the piſton of a ſteam engine, &c. &c. The blowing cylinder has a valve or valves E in its bottom, opening inwards. There proceeds from it a large pipe CF, which enters the regulating cylinder GHKI, and has a valve at top to prevent the air from getting back into the blowing cylinder. It is evident that the air forced into this cylinder muſt raiſe its piſton L, and that it muſt afterwards deſcend, while the other piſton is riſing. It muſt deſcend uniformly, and make a perfectly equable blaſt.

Obſerve, that if the piſton L be at the bottom when the machine begins to work, it will be at the bottom at the end of every ſtroke, if the *tuyere* T emits as much air as the cylinder ABCD furniſhes; nay, it will lie a while at the bottom, for, while it was riſing, air was iſſuing through T. This would make an interrupted blaſt. To prevent this, the orifice T muſt be leſſened; but then there will be a ſurplus of air at the end of each ſtroke, and the piſton L will riſe continually, and at laſt get to the top, and allow air to eſcape. It is juſt poſſible to adjuſt circumſtances, ſo that neither ſhall happen. This is done eaſier by putting a ſtop in the way of the piſton, and putting a valve on the piſton, or on the conducting pipe KST, loaded with a weight a little ſuperior to the intended elaſticity of the air in the cylinder. Therefore, when the piſton is prevented by the ſtop from riſing, the ſnifting valve, as it is called, is forced open, the ſuperfluous air eſcapes, and the blaſt preſerves its uniformity.

It may be of uſe to give the dimenſions of a machine of this kind, which has worked for ſome years at a very great furnace, and given ſatisfaction.

The diameter of the blowing cylinder is 5 feet, and the length of the ſtroke is 6. Its piſton is loaded with 3½ tons. It is worked by a ſteam-engine whoſe cylinder is 3 feet 4 inches wide, with a ſix-feet ſtroke. The regulating cylinder is 8 feet wide, and its piſton is loaded with 8½ tons, making about 2.63 pounds on the ſquare inch; and it is very nearly in equilibrio with the load on the piſton of the blowing cylinder. The conducting pipe KST is 12 inches in diameter, and the orifice of the tuyere was ⅝ of an inch when the engine was erected, but it has gradually enlarged by reaſon of the intenſe heat to which it is expoſed. The ſnifting valve is loaded with 3 pounds on the ſquare inch.

When the engine worked briſkly, it made 18 ſtrokes per minute, and there was always much air diſcharged by the ſnifting valve. When the engine made 15 ſtrokes per minute, the ſnifting valve opened but ſeldom, ſo that things were nearly adjuſted to this ſupply. Each ſtroke of the blowing cylinder ſent in 118 cubic feet of common air. The ordinary preſſure of the air being ſuppoſed 14¾ pounds on an inch, the denſity of the air in the regulating cylinder muſt be $\frac{14.75+2.63}{14.75}, =1.1783$, the natural denſity being 1.

This machine gives an opportunity of comparing the expence of air with the theory. It muſt (at the rate of 15 ſtrokes) expel 30 cubic feet of air in a ſecond through a hole of 1⅝ inches in diameter. This gives a velocity of near 2000 feet per ſecond, and of more than 1600 feet for the condenſed air. This is vaſtly greater than the theory can give, or is indeed poſſible; for air does not ruſh into a void with ſo great velocity. It ſhows with great evidence, that a vaſt quantity of air muſt eſcape round the two piſtons. Their united circumferences amount to above 40 feet, and they move in a dry cylinder. It is impoſſible to prevent a very great loſs. Accordingly, a candle held near the edge of the piſton L has its flame very much diſturbed. This caſe therefore gives no hold for a calculation; and it ſuggeſts the propriety of attempting to diminiſh this great waſte.

This has been very ingeniouſly done (in part at leaſt) at ſome other furnaces. At Omoah foundery, near Glaſgow, the blowing cylinder (alſo worked by a ſteam engine) delivers its air into a cheſt without a bottom, which is immerſed in a large ciſtern of water, and ſupported at a ſmall height from the bottom of the ciſtern, and has a pipe from its top leading to the tuyere. The water ſtands about five feet above the lower brim of the regulating air-cheſt, and by its preſſure gives the moſt perfect uniformity of blaſt, without allowing a particle of air to get off by any other paſſage beſides the tuyere. This is a very effectual regulator, and muſt produce a great ſaving of power, becauſe a ſmaller blowing cylinder will thus ſupply the blaſt. We muſt obſerve, that the loſs round the piſton of the blowing cylinder remains undiminiſhed.

A blowing machine was erected many years ago at Chattillon in France on a principle conſiderably different, and which muſt be perfectly air-tight throughout. Two cylinders AB (fig. 98.), loaded with great Plate CCCCXXXIII. fig. 98.
weights, were ſuſpended at the end of the levers CD, moving round the gudgeon E. From the top F, G of each there was a large flexible pipe which united in H, from whence a pipe KT led to the tuyere T. There were valves at F and G opening outwards, or into the flexible pipes; and other valves L, M, adjoining to them in the top of each cylinder, opening inwards, but kept ſhut by a ſlight ſpring. Motion was given to the lever by a machine. The operation of this blowing machine is evident. When the cylinder A was pulled down, or allowed to deſcend, the water, entering at its bottom, compreſſed the air, and forced it along the paſſage FHKT. In the mean time, the cylinder B was riſing, and the air entered by the valve M. We ſee that the blaſt will be very unequal, increaſing as the cylinder is immerſed deeper. It is needleſs to deſcribe this machine more particularly, becauſe we ſhall give

Pneumatic Engines.

give an account of one which we think perfect in its kind, and which leaves hardly any thing to be desired in a machine of this sort. It was invented by Mr John Laurie, land-surveyor in Edinburgh, about 15 years ago, and improved in some respects since his death by an ingenious person of that city.

Fig. 99.

ABCD (fig. 99.) is an iron cylinder, truly bored within, and evasated a-top like a cup. EFGH is another, truly turned both without and within, and a small matter less than the inner diameter of the first cylinder. This cylinder is close above, and hangs from the end of a lever moved by a machine. It is also loaded with weights at N. KILM is a third cylinder, whose outside diameter is somewhat less than the inside diameter of the second. This inner cylinder is fixed to the same bottom with the outer cylinder. The middle cylinder is loose, and can move up and down between the outer and inner cylinders without rubbing on either of them. The inner cylinder is perforated from top to bottom by three pipes OQ, SV, PR. The pipes OQ, PR have valves at their upper ends O, P, and communicate with the external air below. The pipe SV has a horizontal part VW, which again turns upwards, and has a valve at top X. This upright part WX is in the middle of a cistern of water *fhkg*. Into this cistern is fixed an air-chest *a* YZ *b*, open below, and having at top a pipe *cde* terminating in the tuyere at the furnace.

When the machine is at rest, the valves X, O, P, are shut by their own weights, and the air-chest is full of water. When things are in this state, the middle cylinder EFGH is drawn up by the machinery till its lower brims F and G are equal with the top RM of the inner cylinder. Now pour in water or oil between the outer and middle cylinders: it will run down and fill the space between the outer and inner cylinders. Let it come to the top of the inner cylinder.

Now let the loaded middle cylinder descend. It cannot do this without compressing the air which is between its top and the top of the inner cylinder. This air being compressed will cause the water to descend between the inner and middle cylinders, and rise between the middle and outer cylinders, spreading into the cup; and as the middle cylinder advances downwards, the water will descend farther within it, and rise farther without it. When it has got so far down, and the air has been so much compressed, that the difference between the surface of the water on the inside and outside of this cylinder is greater than the depth of water between X and the surface of the water *fg*, air will go out by the pipe SVW, and will lodge in the air-chest, and will remain there if *c* be shut, which we shall suppose for the present. Pushing down the middle cylinder till the partition touch the top of the inner cylinder, all the air which was formerly between them will be forced into the air-chest, and will drive out water from it. Draw up the middle cylinder, and the external air will open the valves O, P, and again fill the space between the middle and inner cylinders; for the valve X will shut, and prevent the regress of the condensed air. By pushing down the middle cylinder a second time, more air will be forced into the air-chest, and it will at last escape by getting out between its brims Y, Z and the bottom of the cistern; or if we open the passage *c*, it will pass along the conduit *cde* to the tuyere, and form a blast.

The operation of this machine is similar to Mr Haskins's quicksilver pump described by Desaguliers at the end of the second volume of his Experimental Philosophy. The force which condenses the air is the load on the middle cylinder. The use of the water between the inner and outer cylinders is to prevent this air from escaping; and the inner cylinder thus performs the office of a piston, having no friction. It is necessary that the length of the outer and middle cylinders be greater than the depth of the regulator-cistern, that there may be a sufficient height for the water to rise between the middle and outer cylinders, to balance the compressed air, and oblige it to go into the air-chest. A large blast-furnace will require the regulator-cistern five feet deep, and the cylinders about six or seven feet long.

It is in fact a pump without friction, and is perfectly air-tight. The quickness of its operation depends on the small space between the middle cylinder and the two others; and this is the only use of these two. Without these it would be similar to the engine at Chastillon, and operate more unequally and slowly. Its only imperfection is, that if the cylinder begin its motion of ascent or descent rapidly, as it will do when worked by a steam-engine, there will be some danger of water dashing over the top of the inner cylinder and getting into the pipe SV; but should this happen, an issue can easily be contrived for it at V, covered with a loaded valve *v*. This will never happen if the cylinder is moved by a crank.

One blowing cylinder only is represented here, but two may be used.

We do not hesitate in recommending this form of bellows as the most perfect of any, and fit for all uses where standing bellows are required. They will be cheaper than any other sort for common purposes. For a common smith's forge they may be made with square wooden boxes instead of cylinders. They are also easily repaired. They are perfectly tight; and they may be made with a blast almost perfectly uniform, by making the cistern in which the air-chest stands of considerable dimensions. When this is the case, the height of water, which regulates the blast, will vary very little.

This may suffice for an account of blast machines. The leading parts of their construction have been described as far only as was necessary for understanding their operation, and enabling an engineer to erect them in the most commodious manner. Views of complete machines might have amused, but they would not have added to our reader's information.

But the account is imperfect unless we show how their parts may be so proportioned that they shall perform what is expected from them. The engineer should know what size of bellows, and what load on the board or piston, and what size of tuyere, will give the blast which the service requires, and what force must be employed to give them the necessary degree of motion. We shall accomplish these purposes by considering the efflux of the compressed air through the tuyere. The propositions formerly delivered will enable us to ascertain this.

That we may proportion every thing to the power employed,

employed, we muft recollect, that if the pifton of a cylinder employed for expelling air be preffed down with any force p, it muft be confidered as fuperadded to the atmofpheric preffure P on the fame pifton, in order that we may compare the velocity v of efflux with the known velocity V with which air rufhes into a void. By what has been formerly delivered, it appears that this velocity $v=\mathrm{V}\times\sqrt{\frac{p}{\mathrm{P}\times p}}$, where P is the preffure of the atmofphere on the pifton, and p the additional load laid on it. This velocity is expreffed in feet per fecond; and, when multiplied by the area of the orifice (alfo expreffed in fquare feet), it will give us the cubical feet of condenfed air expelled in a fecond: but the bellows are always to be filled again with common air, and therefore we want to know the quantity of common air which will be expelled; for it is this which determines the number of ftrokes which muft be made in a minute, in order that the proper fupply may be obtained. Therefore recollect that the quantity expelled from a given orifice with a given velocity, is in the proportion of the denfity; and that when D is the denfity of common air produced by the preffure P, the denfity d produced by the preffure $\mathrm{P}+p$, is $\mathrm{D}\times\frac{\mathrm{P}+p}{\mathrm{P}}$; or if D be made 1, we have $d=\frac{\mathrm{P}+p}{\mathrm{P}}$.

Therefore, calling the area of the orifice expreffed in fquare feet O, and the quantity of common air, or the cubic feet expelled in a fecond Q, we have $\mathrm{Q}=\mathrm{V}\times\mathrm{O}\times\sqrt{\frac{p}{\mathrm{P}+p}}\times\frac{\mathrm{P}+p}{\mathrm{P}}$.

It will be fufficiently exact for all practical purpofes to fuppofe P to be 15 pounds on every fquare inch of the pifton; and p is then conveniently expreffed by the pounds of additional load on every fquare inch: we may alfo take V=1332 feet.

As the orifice through which the air is expelled is generally very fmall, never exceeding three inches in diameter, it will be more convenient to exprefs it in fquare inches; which being the $\frac{1}{144}$ of a fquare foot, we fhall have the cubic feet of common air expelled in a fecond, or

$$\mathrm{Q}=\frac{1332}{144}\mathrm{O}\sqrt{\frac{p}{\mathrm{P}+p}}\times\frac{\mathrm{P}+p}{\mathrm{P}},=\mathrm{O}\times 9.25\times\sqrt{\frac{p}{\mathrm{P}+p}}\times\frac{\mathrm{P}+p}{\mathrm{P}};$$

and this feems to be as fimple an expreffion as we can obtain.

This will perhaps be illuftrated by taking an example in numbers. Let the area of the pifton be four fquare feet, and the area of the round hole through which the air is expelled be two inches, its diameter being 1.6, and let the load on the pifton be 1728 pounds: this is three pounds on every fquare inch. We have P=15, $p=3$, $\mathrm{P}+p=18$, and O=2; therefore we will have $\mathrm{Q}=2\times 9.25\times\sqrt{\frac{3}{18}}\times\frac{18}{15},=9.053$ cubic feet of common air expelled in a fecond. This will however be diminifhed at leaft one-third by the contraction of the jet; and therefore the fupply will not exceed fix cubic feet per fecond. Suppofing therefore that this blowing machine is a cylinder or prifm of this dimenfion in its fection, the pifton fo loaded would (after having compreffed the air) defcend about 15 inches in a fecond: It would firft fink one-fifth of the whole length of the cylinder pretty fuddenly, till it had reduced the air to the denfity $\frac{18}{15}$, and would then defcend uniformly at the above rate, expelling fix cubic feet of common air in a fecond.

The computation is made much in the fame way for bellows of the common form, with this additional circumftance, that as the loaded board moves round a hinge at one end, the preffure of the load muft be calculated accordingly. The computation, however, becomes a little intricate, when the form of the loaded board is not rectangular: it is almoft ufelefs when the bellows have flexible fides, either like fmiths bellows or like organ bellows, becaufe the change of figure during their motion makes continual variation on the compreffing powers. It is therefore chiefly with refpect to the great wooden bellows, of which the upper board flides down between the fides, that the above calculation is of fervice.

The propriety, however, of this piece of information is evident: we do not know precifely the quantity of air neceffary for animating a furnace; but this calculation tells us what force muft be employed for expelling the air that may be thought neceffary. If we have fixed on the ftrength of the blaft, and the diameter of the cylinder, we learn the weight with which the pifton muft be loaded; the length of the cylinder determines its capacity, the above calculation tells the expence per fecond; hence we have the time of the pifton's coming to the bottom. This gives us the number of ftrokes per minute: the load muft be lifted up by the machine this number of times, making the time of afcent precifely equal to that of defcent; otherwife the machine will either catch and ftop the defcent of the pifton, or allow it to lie inactive for a while of each ftroke. Thefe circumftances determine the labour to be performed by the machine, and it muft be conftructed accordingly. Thus the engineer will not be affronted by its failure, nor will he expend needlefs power and coft.

In machines which force the pifton or bellows-board with a certain determined motion, different from what arifes from their own weight, the computation is extremely intricate. When a pifton moves by a crank, its motion at the beginning and end of each ftroke is flow, and the compreffion and efflux is continually changing: we can however approximate to a ftatement of the force required.

Every time the pifton is drawn up, a certain fpace of the cylinder is filled again with air of the common denfity; and this is expelled during the defcent of the pifton. A certain number of cubic feet of common air is therefore expelled with a velocity which perhaps continually varies; but there is a medium velocity with which it might have been uniformly expelled, and a preffure correfponding to this velocity. To find this, divide the area of the pifton by the area of the blaft-hole (or rather by this area multiplied by 0.613, in order to take in the effect of the contracted jet), and multiply the length of the ftroke performed in a fecond by the quotient arifing from this divifion; the product is the medium velocity of the air (of the natural denfity). Then find by calculation the height through which a heavy body muft fall in order to acquire this velocity; this is the height of a column of homogeneous air which would expel

expel it with this velocity. The weight of this column is the leaſt force that can be exerted by the engine: but this force is too ſmall to overcome the reſiſtance in the middle of the ſtroke, and it is too great even for the end of the ſtroke, and much too great for the beginning of it. But if the machine is turned by a very heavy water-wheel, this will act as a regulator, accumulating in itſelf the ſuperfluous force during the too favourable poſitions of the crank, and exerting it by its *vis inſita* during the time of greateſt effort. A force not greatly exceeding the weight of this column of air will therefore ſuffice. On the other hand, if the ſtrength of the blaſt be determined, which is the general ſtate of the problem, this determines the degree of condenſation of the air, and the load on the ſquare inch of the piſton, or the mean force which the machine muſt exert on it. A table, which will be given preſently, determines the cubic feet of common air expelled in a ſecond, correſponding to this load. This combined with the propoſed dimenſions of the cylinder, will give the deſcent of the piſton or the length of the ſtroke.

Theſe general obſervations apply to all forms of bellows; and without a knowledge of them no perſon can erect a machine for working them without total uncertainty or ſervile imitation. In order, therefore, that they may be uſeful to ſuch as are not accuſtomed to the management of even theſe ſimple formulæ, we inſert the following ſhort table of the velocity and quantity of air diſcharged from a cylinder whoſe piſton is loaded with the pounds contained in the firſt column on every ſquare inch. The ſecond column contains the velocity with which the *condenſed air* ruſhes out through any *ſmall* hole; and the third column is the cubic feet diſcharged from a hole whoſe area is a ſquare inch; column fourth contains the mean velocity of air of the common denſity; and column fifth is the cubic feet of common air diſcharged; the ſixth column is the height in inches at which the force of the blaſt would ſupport a column of water if a pipe were inſerted into the ſide of the cylinder. This is an extremely proper addition to ſuch machines, ſhowing at all times the power of the machines, and teaching us what intenſity of blaſt is employed for different purpoſes. The table is computed from the ſuppoſition that the ordinary preſſure of the air is 15 pounds on a ſquare inch. This is ſomewhat too great, and therefore the velocities are a little too ſmall; but the quantities diſcharged will be found about one-third too great (without affecting the velocities) on account of the convergency of the ſtream.

I	II	III	IV	V	VI
½	239	1.66	247	1.72	14
1	333	2.32	355	2.47	27
1½	404	2.79	437	3.05	40
2	457	3.17	518	3.60	54
2½	500	3.48	584	4.2	68
3	544	3.76	653	4.53	82
3½	582	4.03	715	4.98	95
4	611	4.24	774	5.38	109
4½	642	4.46	822	5.75	122
5	666	4.67	888	6.17	136
5½	603	4.84	950	6.49	150
6	711	5.06	997	6.92	163

This table extends far beyond the limits of ordinary uſe, very few blaſt-furnaces having a force exceeding 60 inches of water.

We ſhall conclude this account of blowing machines with a deſcription of a ſmall one for a blowpipe. ABCD, fig. 100. is a veſſel containing water, about two feet deep. EFGH is the air-box of the blower open below, and having a pipe ILK riſing up from it to a convenient height; an arm ON which graſps this pipe carries the lamp N: the blowpipe LM comes from the top of the upright pipe. PKQ is the feeding pipe reaching near to the bottom of the veſſel. Fig. 100.

Water being poured into the veſſel below, and its cover being put on, which fits the upright pipe, and touches two ſtuds *a*, *a*, projecting from it, blow in a quantity of air by the feeding pipe PQ; this expels the water from the air-box, and occaſions a preſſure which produces the blaſt through the blowpipe M.

In N° 54. of this article, we mentioned an application which has been made of Hero's fountain, at Chemnitz in Hungary, for raiſing water from the bottom of a mine. We ſhall now give an account of this very ingenious contrivance.

In fig. 101. B repreſents the ſource of water elevated above the mouth of the pit 136 feet. From this there is led a pipe B*b*CD four inches diameter. This pipe enters the top of a copper cylinder *bcde*, 8½ feet high, five feet diameter, and two inches thick, and it reaches to within four inches of the bottom; it has a cock at C. This cylinder has a cock at F, and a very large one at E. From the top *bc* proceeds a pipe GHH′ two inches in diameter, which goes down the pit 96 feet, and is inſerted into the top of another braſs cylinder *fghi*, which is 6½ feet high, four feet diameter, and two inches thick, containing 83 cubic feet, which is very nearly one half of the capacity of the other, viz. of 170 cubic feet. There is another pipe NI of four inches diameter, which riſes from within four inches of the bottom of this lower cylinder, is ſoldered into its top, and riſes to the trough NO, which carries off the water from the mouth of the pit. This lower cylinder communicates at the bottom with the water L which collects in the drains of the mine. A large cock K ſerves to admit or exclude this water; another cock M, at the top of this cylinder, communicates with the external air. Fig. 101.

Now ſuppoſe the cock C ſhut, and all the reſt open; the upper cylinder will contain air, and the lower cylinder will be filled with water, becauſe it is ſunk ſo deep that its top is below the uſual ſurface of the mine-waters. Now ſhut the cocks F, E, M, K, and open the cock C. The water of the ſource B muſt run in by the orifice D, and riſe in the upper cylinder, compreſſing the air above it and along the pipe GHH′, and thus acting on the ſurface of the water in the lower cylinder. It will therefore cauſe it to riſe gradually in the pipe IN, where it will always be of ſuch a height that its weight balances the elaſticity of the compreſſed air. Suppoſe no iſſue given to the air from the upper cylinder, it would be compreſſed into one-fifth of its bulk by the column of 136 feet high; for a column of 34 feet nearly balances the ordinary elaſticity of the air. Therefore, when there is an iſſue given to it through the pipe GHH′, it will drive the compreſſed air along this pipe, and it will expel water from the lower cylinder.

der. When the upper cylinder is full of water, there will be 34 cubic feet of water expelled from the lower cylinder. If the pipe IN had been more than 136 feet long, the water would have risen 136 feet, being then in equilibrio with the water in the feeding pipe B b CD (as was shown in N° 52.), by the intervention of the elastic air; but no more water would have been expelled from the lower cylinder than what fills this pipe. But the pipe being only 96 feet high, the water will be thrown out at N with a very great velocity. If it were not for the great obstructions which water and air must meet with in their passage along pipes, it would issue at N with a velocity of more than 50 feet per second. It issues much more slowly, and at last the upper cylinder is full of water, and the water would enter the pipe GH and enter the lower cylinder, and without displacing the air in it, would rise through the discharging pipe IN, and run off to waste. To prevent this there hangs in the pipe HG a cork ball or double cone, by a brass wire which is guided by holes in two cross pieces in the pipe HG. When the upper cylinder is filled with water, this cork plugs up the orifice G, and no water is wasted; the influx at D now stops. But the lower cylinder contains compressed air, which would balance water in a discharging pipe 136 feet high, whereas IN is only 96. Therefore the water will continue to flow at N till the air has so far expanded as to balance only 96 feet of water, that is, till it occupies one-fourth of its ordinary bulk, that is, one-fourth of the capacity of the upper cylinder, or $42\frac{1}{2}$ cubic feet. Therefore $42\frac{1}{2}$ cubic feet will be expelled, and the efflux at N will cease; and the lower cylinder is about one half full of water. When the attending workman observes this, he shuts the cock C. He might have done this before, had he known when the orifice G was stopped; but no loss ensues from the delay. At the same time the attendant opens the cock E, the water issues with great violence, being pressed by the condensed air from the lower cylinder. It therefore issues with the sum of its own weight and of this compression. These gradually decrease together, by the efflux of the water and the expansion of the air; but this efflux stops before all the water has flowed out: for there is $42\frac{1}{2}$ feet of the lower cylinder occupied by air. This quantity of water remains, therefore, in the upper cylinder nearly: the workman knows this, because the discharged water is received first of all into a vessel containing three-fourths of the capacity of the upper cylinder. Whenever this is filled, the attendant opens the cock K by a long rod which goes down the shaft; this allows the water of the mine to fill the lower cylinder, allows the air to get into the upper cylinder, and this allows the remaining water to run out of it.

And thus every thing is brought into its first condition; and when the attendant sees no more water come out at E, he shuts the cocks E and M, and opens the cock C, and the operation is repeated.

There is a very surprising appearance in the working of this engine. When the efflux at N has stopped, if the cock F be opened, the water and air rush out together with prodigious violence, and the drops of water are changed into hail or lumps of ice. It is a sight usually shown to strangers, who are desired to hold their hats to receive the blast of air: the ice comes out with such violence as frequently to pierce the hat like a pistol bullet. This rapid congelation is a remarkable instance of the general fact, that air by suddenly expanding, generates cold, its capacity for heat being increased. Thus the peasant cools his broth by blowing over the spoon, even from warm lungs: a stream of air from a pipe is always cooling.

The above account of the procedure in working this engine shows that the efflux both at N and E becomes very slow near the end. It is found convenient therefore not to wait for the complete discharges, but to turn the cocks when about 30 cubic feet of water have been discharged at N: more work is done in this way. A gentleman of great accuracy and knowledge of these subjects took the trouble, at our desire, of noticing particularly the performance of the machine. He observed that each stroke, as it may be called, took up about three minutes and one-eighth; and that 32 cubic feet of water were discharged at N, and 66 were expended at E. The expence therefore is 66 feet of water falling 136 feet, and the performance is 32 raised 96, and they are in the proportion of 66×136 to 32×96, or of 1 to 0.3422, or nearly as 3 to 1. This is superior to the performance of the most perfect undershot mill, even when all friction and irregular obstructions are neglected; and is not much inferior to any overshot pump-mill that has yet been erected. When we reflect on the great obstructions which water meets with in its passage through long pipes, we may be assured that, by doubling the size of the feeder and discharger, the performance of the machine will be greatly improved; we do not hesitate to say, that it would be increased one-third: it is true that it will expend more water; but this will not be nearly in the same proportion; for most of the deficiency of the machine arises from the needless velocity of the first efflux at N. The discharging pipe ought to be 110 feet high, and not give sensibly less water.

Then it must be considered how inferior in original expence this simple machine must be to a mill of any kind which would raise 10 cubic feet 96 feet high in a minute, and how small the repairs on it need be, when compared with a mill.

And, lastly, let it be noticed, that such a machine can be used where no mill whatever can be put in motion. A small stream of water, which would not move any kind of wheel, will here raise one-third of its own quantity to the same height; working as fast as it is supplied.

For all these reasons, we think that the Hungarian machine eminently deserves the attention of mathematicians and engineers, to bring it to its utmost perfection, and into general use. There are situations where this kind of machine may be very useful. Thus, where the tide rises 17 feet, it may be used for compressing air to seven-eighths of its bulk; and a pipe leading from a very large vessel inverted in it, may be used for raising the water from a vessel of one eighth of its capacity 17 feet high; or if this vessel has only $\frac{1}{16}$ of the capacity of the large one set in the tide way, two pipes may be led from it, one into the small vessel and the other into an equal vessel 16 feet higher, which receives the water from the first. Thus one sixteenth of the water may be raised 34 feet, and a smaller quantity to a still greater height; and this with a kind of power that can hardly be applied in any other way. Machines of this kind are described by Schottus, Sturmius, Leupold, and other old writers; and they should not be forgotten, because opportunities may

Fig. 1.

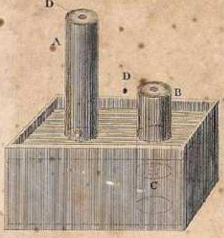


Fig. 2.

Fig. 3.

Fig. 4.

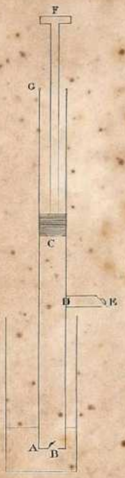
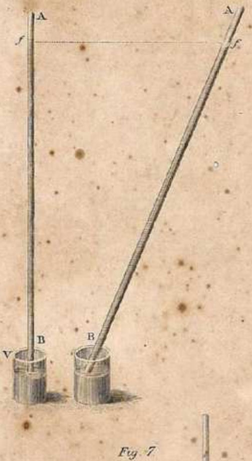


Fig. 5.



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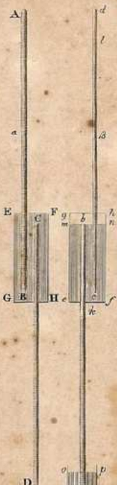


Fig. 7

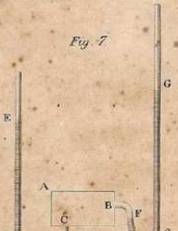
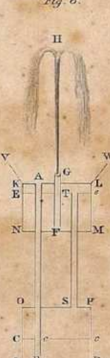


Fig. 8.



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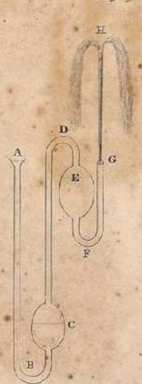
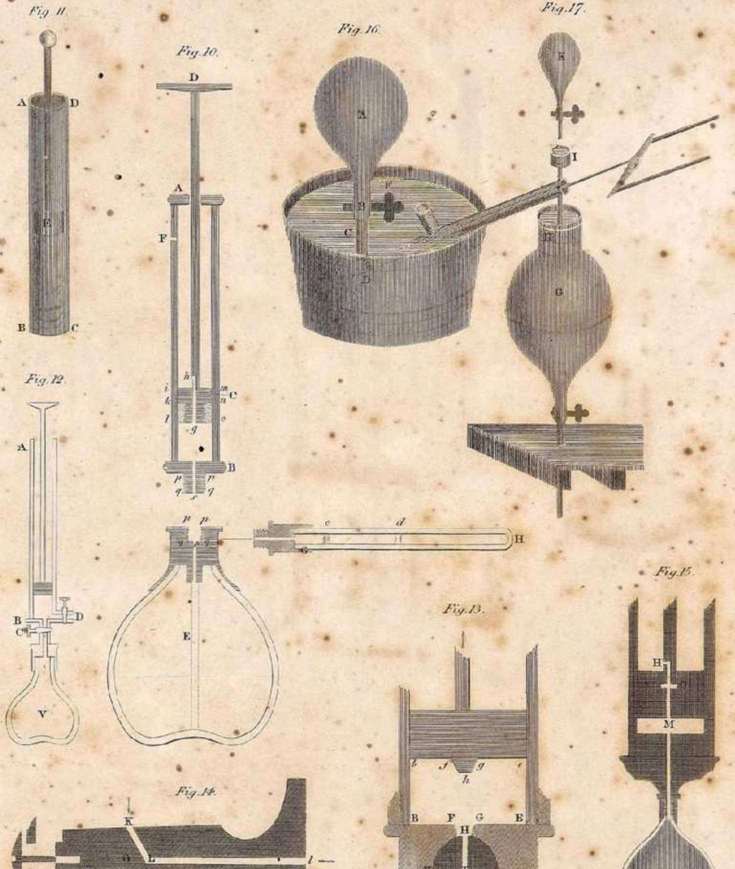
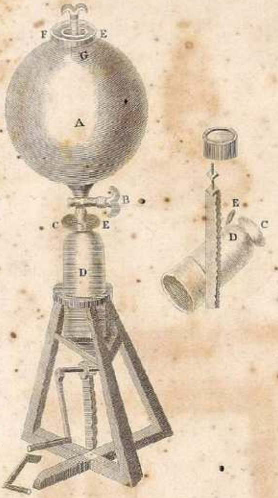


E. Mitchell Sculpt.



E. Mitchell sculp.

Fig. 18.



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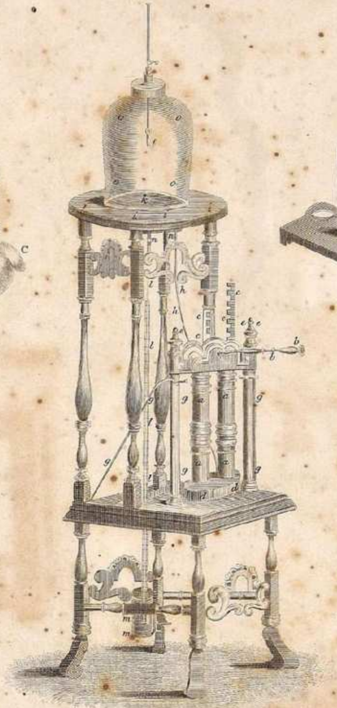


Fig. 20.

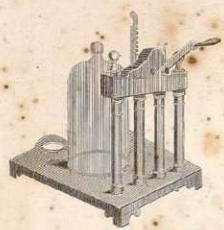
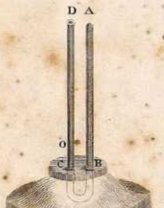


Fig. 21.



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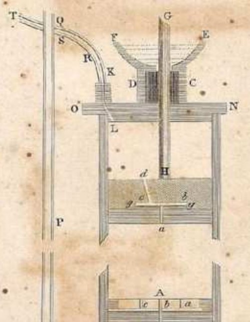

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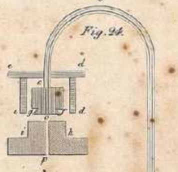
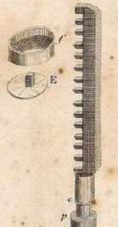


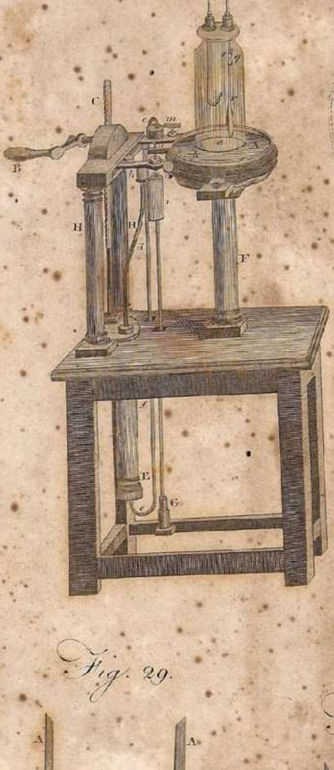
Fig. 25.

Fig. 22.



E. Mitchell sculp^t.

Fig. 26.



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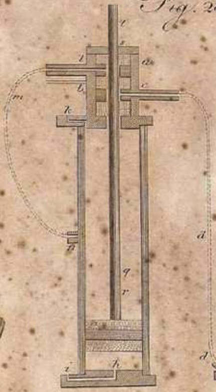
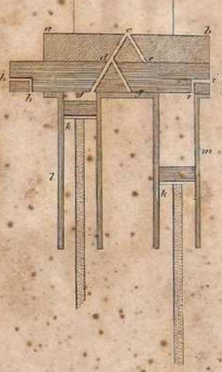


Fig. 27.

Fig. 31.



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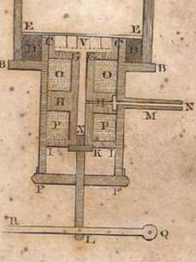
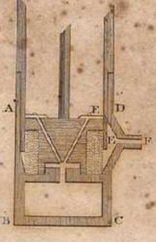


Fig. 30.



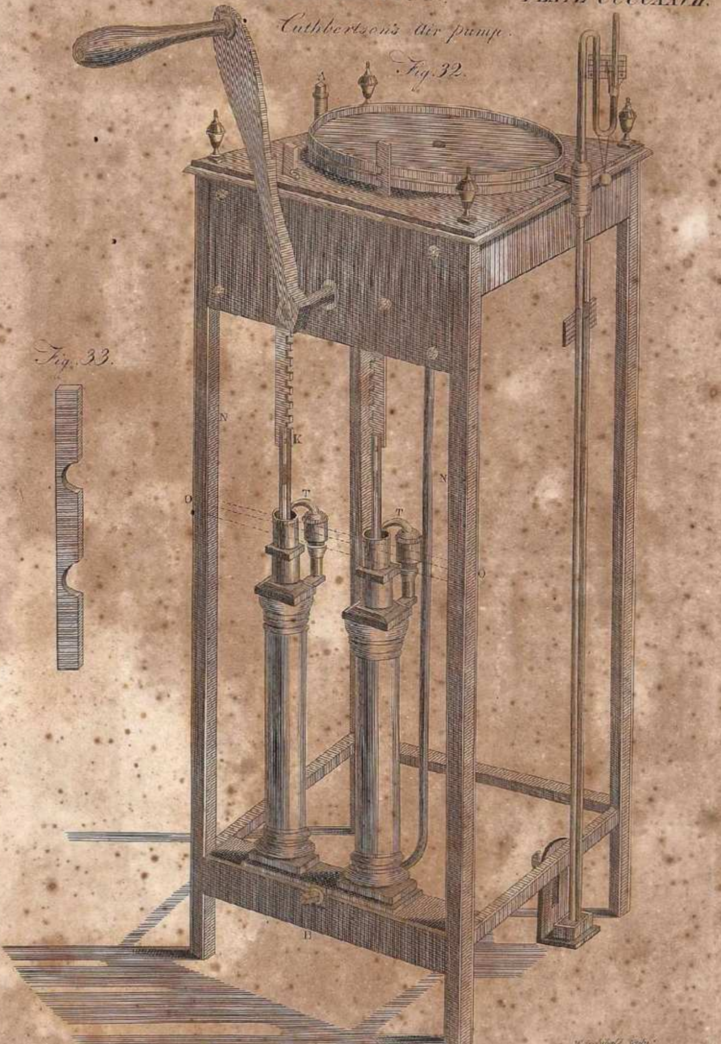
W. Archibald sculp.

PNEUMATICS. PLATE CCCCXXVII.

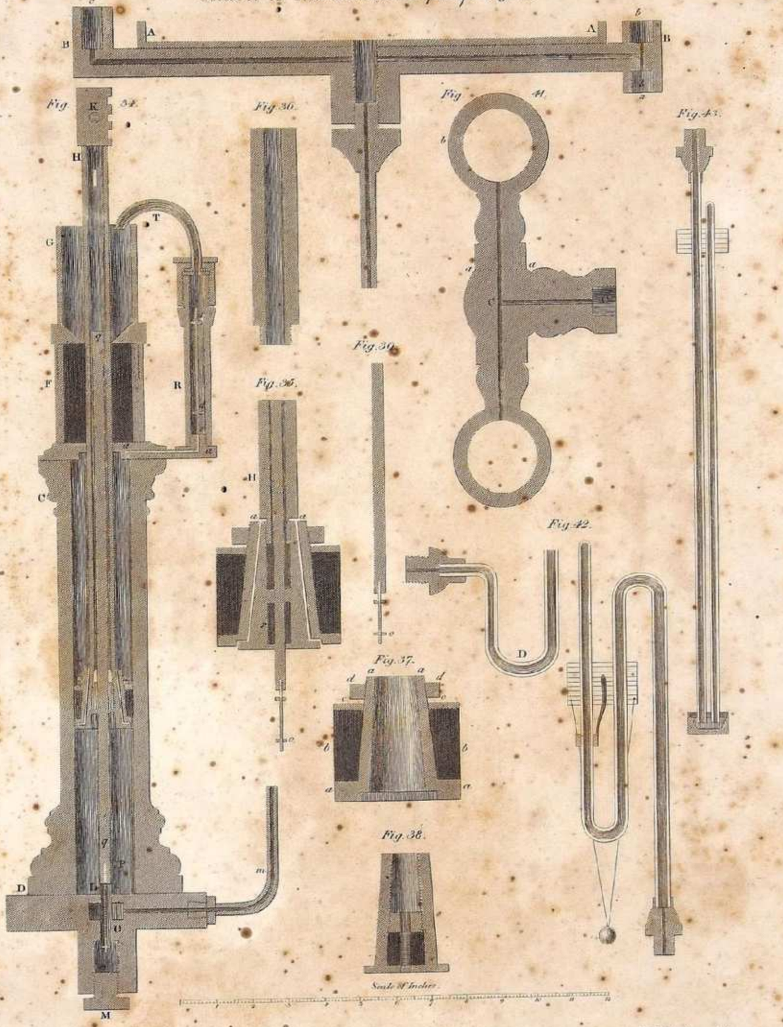
Cuthbertson's Air pump.

Fig. 32.

Fig. 33.



Section of Cuthbertson's air pump. Fig. 40.



R. Mitchell sculp.

Fig. 44.

Fig. 45.

Fig. 46.

Fig. 47.

Fig. 48.

Fig. 49.

Fig. 50.

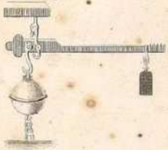


Fig. 51.

Fig. 52.

Fig. 53.

Fig. 54.

Fig. 55.

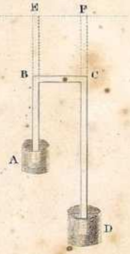


Fig. 56.

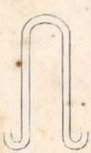


Fig. 57.

Fig. 58.

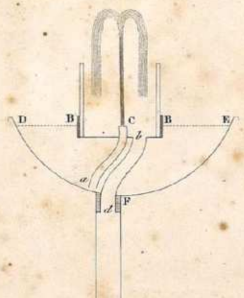
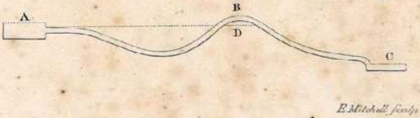
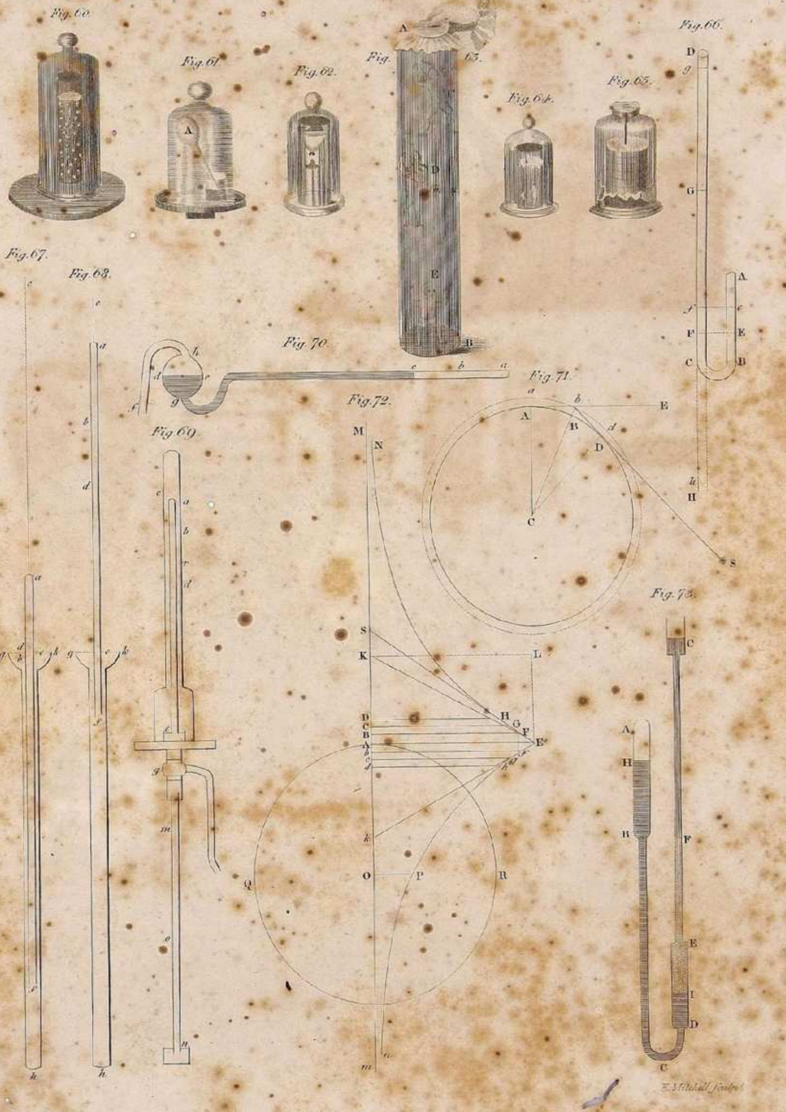


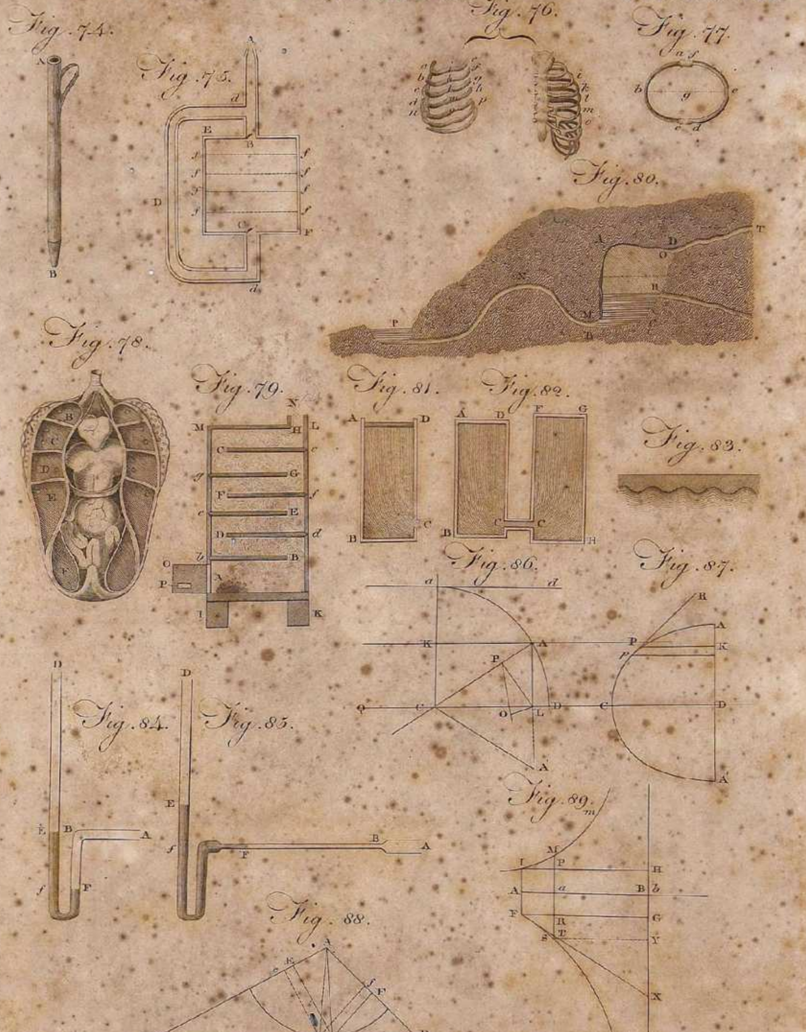
Fig. 59.



E. Mitchell sculp.t



E. Mitchell sculpt.



W. Archibald Sculpt.

Fig. 90.

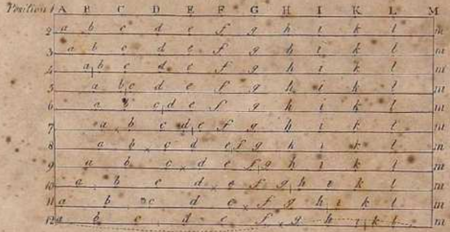


Fig. 91.

Fig. 93.

Fig. 92.

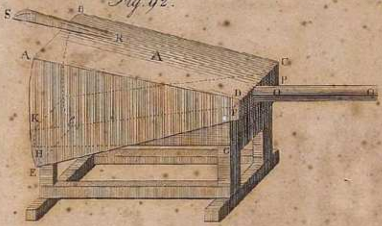


Fig. 94.

Fig. 96

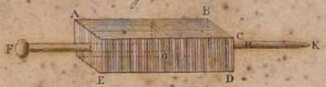


Fig. 97.

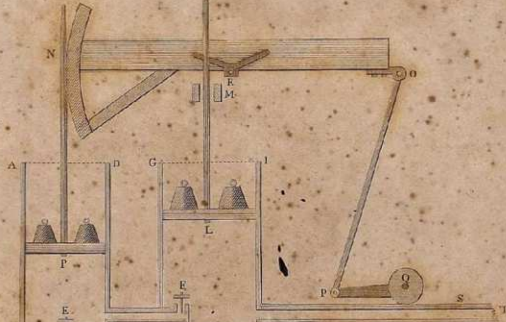


Fig. 95

Fig. 98.

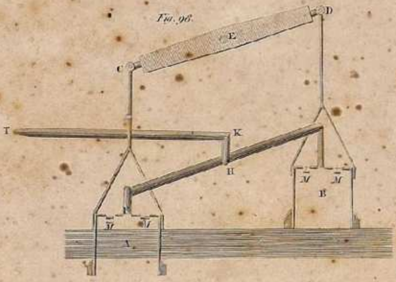


Fig. 100.

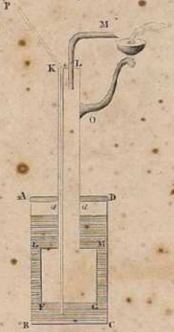


Fig. 99.

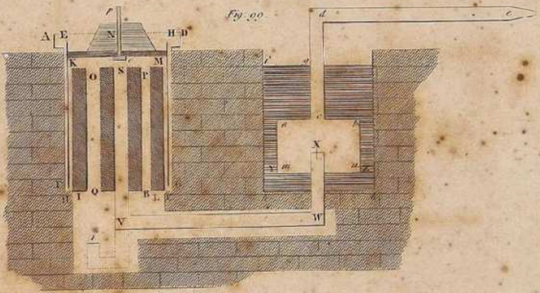


Fig. 101.

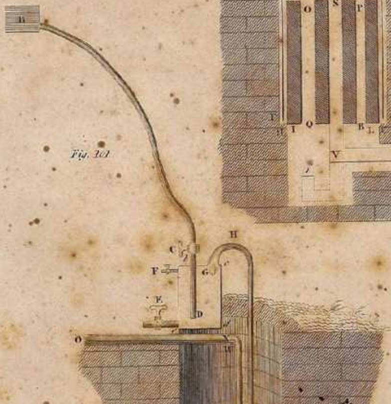
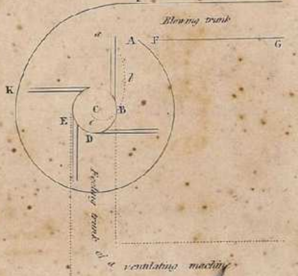


Fig. 102.



Engd. by W. & D. Lizars Edinr.

Pneumatic Engines

may offer of making them highly useful. A gentleman's house in the country may thus be supplied with water by a machine that will cost little, and hardly go out of repair.

The last pneumatical engine which we shall speak of at present is the common fanners, used for winnowing grain, and for drawing air out of a room: and we have but few observations to make on them.

Fig. 102.

The wings of the fanners are inclosed in a cylinder or drum, whose circular sides have a large opening BDE (fig. 102.) round the centre, to admit the air. By turning the wings rapidly round, the air is hurried round along with them, and thus acquires a centrifugal tendency, by which it presses strongly on the outer rim of the drum: this is gradually detached from the circle as at KI, and terminated in a trunk IHGF, which goes off in a tangential direction; the air therefore is driven along this passage.

If the wings were disposed in planes passing through the axis C, the compression of the air by the anterior surface would give it some tendency to escape in every direction, and would obstruct in some degree the arrival of more air through the side-holes. They are therefore reclined a little backward, as represented in the figure. It may be shown that their best form would be that of a hyperbolic spiral *a b c*; but the straight form approaches sufficiently near to the most perfect shape.

Much labour is lost, however, in carrying the air round those parts of the drum where it cannot escape. The fanners would either draw or discharge almost twice as much air if an opening were made all round one side. This could be gradually contracted (where required for winnowing) by a surrounding cone, and thus directed against the falling grain: this has been verified by actual trial. When used for drawing air out of a room for ventilation, it would be much better to remove the outer side of the drum entirely, and let the air fly freely off on all sides; but the flat sides are necessary, in order to prevent the air from arriving at the fanners any other way but through the central holes, to which trunks should be fitted leading to the apartment which is to be ventilated.

Pneumatosis ‖ Pococke.

PNEUMATOSIS. See MEDICINE, N° 336.

PNEUMONIA. See MEDICINE, N° 183.

PNEUMONICS, in *Pharmacy*, medicines proper in diseases of the lungs, in which respiration is affected.

PO, a large and celebrated river of Italy, which has its source at Mount Vis in Piedmont, and on the confines of Dauphiny. It runs through Piedmont, Montferrat, the Milanese, and duchy of Mantua; from thence it runs to the borders of the Parmesan, and a part of the Modenese; and having entered the Ferrarese, it begins to divide at Fichernolo, and proceeds to discharge itself into the gulf of Venice by four principal mouths. As it passes along, it receives several rivers, and often overflows its banks, doing a great deal of mischief: the reason of which is, that most of those rivers descend from the Alps, and are increased by the melting of the snow.

POA, MEADOW-GRASS; a genus of plants belonging to the pentandria class, and in the natural method ranking under the fourth order, *Gramina*. See BOTANY and AGRICULTURE *Index*.

POCHETTI. See BARBATELLI.

POCOCKE, DR EDWARD, a learned oriental scholar, was the eldest son of the Rev. Edward Pococke; and was born at Oxford in 1604, where he was also educated. In 1628 he was admitted probationer-fellow of his college, and about the same time had prepared an edition of the Second Epistle of St Peter, the Second and Third of St John, and that of St Jude, in Syriac and Greek, with a Latin Translation and Notes. In 1629 he was ordained priest, and appointed chaplain to the English merchants at Aleppo, where he continued five or six years; in which time he distinguished himself by his fortitude and zeal while the plague raged there. At length returning to England, he was in 1636 appointed reader of the Arabic lectures founded by Archbishop Laud. Three years after he went to Constantinople, where he prosecuted his studies of the eastern tongues, and procured many valuable manuscripts. After near four years stay in that city, he embarked in 1640; and taking Paris in his way, visited Gabriel Sionita the famous Maronite, and Hugo Grotius. In 1643 he was presented to the rectory of Childrey in Berks; and about three years after married the daughter of Thomas Burdett, Esq. About the middle of 1647 he obtained the restitution of the salary of his Arabic lecture, which had been detained from him about three years. In 1648 King Charles I. who was then prisoner in the isle of Wight, nominated Mr Pococke to the professorship of Hebrew, and the canonry of Christ-church annexed to it; but in 1650 he was ejected from his canonry for refusing to take the engagement, and soon after a vote passed for depriving him of his Hebrew and Arabic lectures; but several governors of houses, &c. presenting a petition in his favour, he was suffered to enjoy both these places. He had some years before published his *Specimen Historiæ Arabum;* and now appeared his *Porta Mosis:* and soon after the English Polyglot edition of the Bible, to which he had largely contributed, and also Eutychius's Annals, with a Latin version. At the Restoration, he was restored to the canonry of Christ-church, and also received the degree of doctor of divinity. He then published his Arabic version of Grotius's Treatise of the Truth of the Christian Religion; and an Arabic poem entitled *Laimato l' Ajam*, with a Latin translation and notes. Soon after he published Gregory Abul Pharajius's *Historia Dynastiarum*. In 1674 he published an Arabic version of the chief parts of the Liturgy of the church of England; and a few years after his Commentary on the Prophecies of Micah, Malachi, Hosea, and Joel. This great man died in 1691, after having been for many years confessedly the first person in Europe for eastern learning; and was no less worthy of admiration for his uncommon modesty.

modesty and humility, and all the virtues that can adorn a Christian. His theological works were republished at London in 1740, in two volumes in folio.

PODAGRA, or the GOUT. See MEDICINE, N° 211.

PODALIRIUS, son of Æsculapius and Epione, was one of the pupils of the Centaur Chiron, under whom he made himself such a master of medicine, that during the Trojan war the Greeks invited him to their camp to stop a pestilence which had baffled the skill of all their physicians. Some suppose, however, that he went to the Trojan war, not in the capacity of a physician in the Grecian army, but as a warrior, attended by his brother Machaon, in 30 ships, with soldiers from Oechalia, Ithome, and Trica. At his return Podalirius was shipwrecked on the coast of Caria, where he cured of the falling sickness a daughter of the king of the place. He fixed his habitation there; and built two towns, one of which he called *Syrna*, after his wife. The Carians, on his death, built him a temple, and paid him divine honours.

PODEX, in *Anatomy*, the same with ANUS.

PODGRAJE. See ASISIA.

PODOLIA, a province of Poland, bounded on the east by Volhinia and the river Ukrain; on the north and north-east, by Budsiac Tartary; on the south-east, by the river Niester, which separates it from Bessarabia and Moldavia in European Turkey on the south-west; and by the province of Red Russia on the north-west. It is usually divided into the Upper and Lower. In the Upper, which is the western part, the chief town is Kamieck, the capital of Podolia, and of a palatinate. In the Lower or eastern part of Podolia the chief town is Bracklaw, the capital of a palatinate.

PODOPHYLLUM, a genus of plants belonging to the polyandria class; and in the natural method ranking under the 27th order, *Rhœadeæ*. See BOTANY *Index*.

PODURA, or SPRINGTAIL, a genus of insects of the order of aptera. See ENTOMOLOGY *Index*.

POE-BIRD is an inhabitant of some of the South sea islands, where it is held in great esteem and veneration by the natives. It goes by the name of *kogo* in New Zealand; but it is better known by that of *poë-bird*. It is somewhat less than our blackbird, and is remarkable for the sweetness of its note, as well as the beauty of its plumage. Its flesh is also delicate food.

POECILE was a famous portico at Athens, which received its name from the variety (ποικιλος) of paintings which it contained. Zeno kept his school there; and there also the stoics received their lessons, whence their name, *ἀ στοα, a porch*. The Pœcile was adorned, among many others, with a picture of the siege and sacking of Troy, the battle of Theseus against the Amazons, and the fight between the Lacedæmonians and Athenians at Oenoe in Argolis. The only reward which Miltiades obtained after the battle of Marathon was to have his picture drawn more conspicuous than that of the rest of the officers that fought with him, in the representation which was made of the engagement, and which was hung up in the Pœcile in commemoration of that celebrated victory.

POEM, a poetical composition. See POETRY.

POESTUM, or POSIDONIA, an ancient city of Grecia Magna, now part of the kingdom of Naples. It was founded by one of those colonies from Greece which in the early ages established themselves in Italy; and it flourished before the foundation of Rome itself. It was destroyed by the Goths on the decline of the Roman empire, who in their barbarous zeal for the Christian religion overturned every place of Pagan worship which was exposed to their ravages. Since that time it has been in ruins; and these ruins were unknown till they were discovered in the following manner: "In the year 1755 (says the author of the *Antiquities, History, and Views of Pæstum*), an apprentice to a painter at Naples, who was on a visit to his friends at Capaccio, by accident took a walk to the mountains which surround the territory of Pœstum. The only habitation he perceived was the cottage of a farmer, who cultivated the best part of the ground, and reserved the rest for pasture. The ruins of the ancient city made a part of this view, and particularly struck the eyes of the young painter; who approaching nearer, saw with astonishment walls, towers, gates and temples. Upon his return to Capaccio, he consulted the neighbouring people about the origin of these monuments of antiquity. He could only learn, that this part of the country had been uncultivated and abandoned during their memory; that about ten years before, the farmer, whose habitation he had noticed, established himself there; and that having dug in many places, and searched among the ruins that lay round him, he had found treasures sufficient to enable him to purchase the whole. At the painter's return to Naples, he informed his master of these particulars, whose curiosity was so greatly excited by the description, that he took a journey to the place, and made drawings of the principal views. These were shown to the king of Naples, who ordered the ruins to be cleared, and Pœstum arose from the obscurity in which it had remained for upwards of 700 years, as little known to the neighbouring inhabitants as to travellers."

Our author gives the following description of it in its present state. It is, says he, of an oblong figure, about two miles and a half in circumference. It has four gates, which are opposite to each other. On the key-stone of the arch of the north gate, on the outside, is the figure of Neptune in basso relievo, and within a hippocampus. The walls which still remain are composed of very large cubical stones, and are extremely thick, in some parts 18 feet. That the walls have remained unto this time is owing to the very exact manner in which the stones are fitted to one another (a circumstance observed universally in the masonry of the ancients), and perhaps in some measure to a stalactical concretion which has grown over them. On the walls here and there are placed towers of different heights; those near the gates being much higher and larger than the others, and evidently of modern workmanship. He observes, that, from its situation among marshes, bituminous and sulphureous springs, Pœstum must have been unwholesome; a circumstance mentioned by Strabo, *Morbosam eam facit fluvius in paludes diffusus*. In such a situation the water must have been bad. Hence the inhabitants were obliged to convey that necessary of life from purer springs by means of aqueducts, of which many vestiges still remain.

The principal monuments of antiquity are a theatre, an amphitheatre, and three temples. The theatre and amphitheatre are much ruined. The first temple is hexastylos,

Pæſtum. hexaſtylos, and amphiproſtylos. At one end, the pilaſters and two columns which divided the cella from the pronaos are ſtill remaining. Within the cella are two rows of ſmaller columns, with an architrave, which ſupport the ſecond order. This temple our author takes to be of that kind called by Vitruvius *hyphæthros*, and ſupports his opinion, by a quotation from that author. The ſecond temple is alſo amphiproſtylos: it has nine columns in front and 18 in flank, and ſeems to be of that kind called by Vitruvius *pſeudodipteros*. The third is likewiſe amphiproſtylos. It has ſix columns in front and 13 in flank. Vitruvius calls this kind of temple *peripteros*. "The columns of theſe temples (ſays our author) are of that kind of Doric order which we find employed in works of the greateſt antiquity. They are hardly five diameters in height. They are without baſes, which alſo has been urged as a proof of their antiquity; but we do not find that the ancients ever uſed baſes to this order, at leaſt till very late. Vitruvius makes no mention of baſes for this order; and the only inſtance we have of it is in the firſt order of the Coliſæum at Rome, which was built by Veſpaſian. The pillars of theſe temples are fluted with very ſhallow flutings in the manner deſcribed by Vitruvius. The columns diminiſh from the bottom, which was the moſt ancient method almoſt univerſally in all the orders. The columns have aſtragals of a very ſingular form; which ſhows the error of thoſe who imagine that this member was firſt invented with the Ionic order, to which the Greeks gave an aſtragal, and that the Romans were the firſt who applied it to the Doric. The echinus of the Capitol is of the ſame form with that of the temple of Corinth deſcribed by Le Roy." See *Swinburne's Travels in the Two Sicilies*, vol. ii. p. 131—140. Pæſtum, Poet.

POET, the author of a poem. See the article POETRY.

Provençal POETS. See TROUBADOURS.

POETRY.

AMIDST thoſe thick clouds which envelope the firſt ages of the world, reaſon and hiſtory throw ſome lights on the origin and primitive employment of this divine art. Reaſon ſuggeſts, that before the invention of letters, all the people of the earth had no other method of tranſmitting to their deſcendants the principles of their worſhip, their religious ceremonies, their laws, and the renowned actions of their ſages and heroes, than by poetry; which included all theſe objects in a kind of hymns that fathers ſung to their children, in order to engrave them with indelible ſtrokes in their hearts. Hiſtory not only informs us, that Moſes and Miriam, the firſt authors that are known to mankind, ſung, on the borders of the Red ſea, a ſong of divine praiſe, to celebrate the deliverance which the Almighty had vouchſafed to the people of Iſrael, by opening a paſſage to them through the waters; but it has alſo tranſmitted to us the ſong itſelf, which is at once the moſt ancient monument and a maſterpiece of poetic compoſition.

1 Origin of poetry.

The Greeks, a people the moſt ingenious, the moſt animated, and in every ſenſe the moſt accompliſhed, that the world ever produced—ſtrove to raviſh from the Hebrews the precious gift of poetry, which was vouchſafed them by the Supreme Author of all nature, that they might aſcribe it to their falſe deities. According to their ingenious fictions, Apollo became the god of poetry, and dwelt on the hills of Phocis, Parnaſſus and Helicon, whoſe feet were waſhed by the waters of Hippocrene, of which each mortal that ever drank was ſeized with a ſacred delirium. The immortal ſwans floated on its waves. Apollo was accompanied by the Muſes—thoſe nine learned ſiſters—the daughters of Memory: and he was conſtantly attended by the Graces. Pegaſus, his winged courſer, tranſported him with a rapid flight into all the regions of the univerſe. Happy emblems! by which we at this day embelliſh our poetry, as no one has ever yet been able to invent more brilliant images.

The literary annals of all nations afford veſtiges of poetry from the remoteſt ages. They are found among the moſt ſavage of the ancient barbarians, and the moſt deſolate of all the Americans. Nature aſſerts her rights in every country and every age. Tacitus mentions the verſes and the hymns of the Germans, at the time when that rough people yet inhabited the woods, and while their manners were ſtill ſavage. The firſt inhabitants of Runnia and the other northern countries, thoſe of Gaul, Albion, Iberia, Auſonia, and other nations of Europe, had their poetry, as well as the ancient people of Aſia, and of the known borders of Africa. But the ſimple productions of nature have conſtantly ſomething unformed, rough, and ſavage. The Divine Wiſdom appears to have placed the ingenious and poliſhed part of mankind on the earth, in order to refine that which comes from her boſom rude and imperfect: and thus art has poliſhed poetry, which iſſued quite naked and ſavage from the brains of the firſt of mankind.

But what is Poetry? It would be to abridge the limits of the poetic empire, to contract the ſphere of this divine art, ſhould we ſay, in imitation of all the dictionaries and other treatiſes on verſification, That *poetry is the art of making verſes, of lines or periods that are in rhyme or metre.* This is rather a grammatical explanation of the word, than a real definition of the thing, and it would be to degrade poetry thus to define it. The father of criticiſm has denominated poetry τεχνη μιμητικη, *an imitative art*: but this, though juſt in itſelf, is too general for a definition, as it does not diſcriminate poetry from other arts which depend equally on imitation. The juſteſt definition ſeems to be that given by Baron Bielfield*, *That poetry is the art of expreſſing our thoughts by fiction.* In fact, it is after this manner (if we reflect with attention) that all the metaphors and allegories, all the various kinds of fiction, form the firſt materials of a poetic edifice: it is thus that all images, all compariſons, alluſions, and figures, eſpecially thoſe which perſonify moral ſubjects, as virtues and vices, concur to the decoration of ſuch a ſtructure.

2 Definition of poetry.

* Elem. of Univ. Erud.

ſtructure. A work, therefore, that is filled with invention, that inceſſantly preſents images which render the reader attentive and affected, where the author gives intereſting ſentiments to every thing that he makes ſpeak, and where he makes ſpeak by ſenſible figures all thoſe objects which would affect the mind but weakly when clothed in a ſimple proſaic ſtyle, ſuch a work is a poem. While that, though it be in verſe, which is of a didactic, dogmatic, or moral nature, and where the objects are preſented in a manner quite ſimple, without fiction, without images or ornaments, cannot be called *poetry*, but merely a work in verſe: for the art of reducing thoughts, maxims, and periods, into rhyme or metre, is very different from the art of poetry.

An ingenious fable, a lively and intereſting romance, a comedy, the ſublime narrative of the actions of a hero, ſuch as the Telemachus of M. Fenelon, though written in proſe, but in meaſured proſe, is therefore a work of poetry: becauſe the foundation and the ſuperſtructure are the productions of genius, as the whole proceeds from fiction; and truth itſelf appears to have employed an innocent and agreeable deception to inſtruct with efficacy. This is ſo true, that the pencil alſo, in order to pleaſe and affect, has recourſe to fiction; and this part of painting is called the *poetic compoſition of a picture*. It is therefore by the aid of fiction that poetry, ſo to ſpeak, paints its expreſſions, that it gives a body and a mind to its thoughts, that it animates and exalts that which would otherwiſe have remained arid and inſenſible. It is the peculiar privilege of poetry to exalt inanimate things into animals, and abſtract ideas into perſons. The former licence is ſo common, that it is now conſidered as nothing more than a characteriſtical dialect appropriated by the poets to diſtinguiſh themſelves from the writers of proſe; and it is at the ſame time ſo eſſential, that we queſtion much if this ſpecies of compoſition could ſubſiſt without it: for it will perhaps, upon examination, be found, that in every poetical deſcription ſome of the qualities of Animal Nature are aſcribed to things not having life. Every work, therefore, where the thoughts are expreſſed by fictions or images, is poetic; and every work where they are expreſſed naturally, ſimply, and without ornament, although it be in verſe, is proſaic.

Verſe, however, is not to be regarded as foreign or ſuperfluous to poetry. To reduce thoſe images, thoſe fictions, into verſe, is one of the greateſt difficulties in poetry, and one of the greateſt merits in a poem: and for theſe reaſons, the cadence, the harmony of ſounds, particularly that of rhyme, delight the ear to a high degree, and the mind inſenſibly repeats them while the eye reads them. There reſults therefore a pleaſure to the mind, and a ſtrong attachment to theſe ornaments: but this pleaſure would be frivolous, and even childiſh, if it were not attended by a real utility. Verſes were invented in the firſt ages of the world, merely to aid and to ſtrengthen the memory: for cadence, harmony, and eſpecially rhyme, afford the greateſt aſſiſtance to the memory that art can invent; and the images, or poetic fictions, that ſtrike our ſenſes, aſſiſt in graving them with ſuch deep traces in our minds, as even time itſelf frequently cannot efface. How many excellent apophthegms, ſentences, maxims, and precepts, would have been buried in the abyſs of oblivion, if poetry had not preſerved them by its harmony? To give more efficacy to this lively impreſſion, the firſt poets ſung their verſes, and the words and phraſes muſt neceſſarily have been reduced, at leaſt to cadence, or they could not have been ſuſceptible of muſical expreſſion. One of the great excellencies, therefore, though not a neceſſary conſtituent of poetry, conſiſts in its being expreſſed in verſe. See Part III.

3 Verſe, though not eſſential to poetry, one of its excellencies.

PART I. GENERAL PRINCIPLES OF THE ART.

SECT. I. *Of the Eſſence and End of Poetry.*

THE *eſſence* of *Polite ARTS* in general, and conſequently of poetry in particular, conſiſts in *expreſſion*; and we think that, to be poetic, the expreſſion muſt neceſſarily ariſe from *fiction*, or invention. (See the article ART, particularly from N° 12. to the end). This invention, which is the fruit of happy genius alone, ariſes, 1. From the ſubject itſelf of which we undertake to treat: 2. From the manner in which we treat that ſubject, or the ſpecies of writing of which we make uſe: 3. From the plan that we propoſe to follow in conformity to this manner; and, 4. From the method of executing this plan in its full detail. Our firſt guides, the ancients, afford us no lights that can elucidate all theſe objects in general. The precepts which Ariſtotle lays down, relate to epic and dramatic poetry only: and which, by the way, confirms our idea, that antiquity itſelf made the eſſence of poetry to conſiſt in fiction, and not in that ſpecies of verſe which is deſtitute of it, or in that which is not capable of it. But ſince this art has riſen to a great degree of perfection; and as poetry, like electricity, communicates its fire to every thing it touches, and animates and embelliſhes whatever it treats; there ſeems to be no ſubject in the univerſe to which poetry cannot be applied, and which it cannot render equally brilliant and pleaſing. From this univerſality of poetry, from its peculiar property of expreſſion by fiction, which is applicable to all ſubjects, have ariſen its different ſpecies, of which a particular deſcription will be given in the *ſecond* part.

4 Eſſence of poetry.

Horace, in a well-known verſe, has been ſuppoſed to declare the *end* of poetry to be twofold, to pleaſe, or to inſtruct:

Aut prodeſſe volunt, aut delectare poetæ.

But Dr Beattie * maintains, that the ultimate end of this art is to pleaſe; inſtruction being only one of the means (and not always a neceſſary one) by which that ultimate end is to be accompliſhed. The paſſage rightly underſtood, he obſerves, will not appear to contain any thing inconſiſtent with this doctrine. The author is there ſtating a compariſon between the Greek and Roman writers, with a view to the poetry of the ſtage; and, after commending the former for their correctneſs, and for the liberal ſpirit wherewith they conducted their literary labours, and blaming his countrymen for their inaccuracy

5 End of poetry.

* *Eſſays on Poetry and Muſic*, Part i. chap. i.

Effence and End of Poetry. inaccuracy and avarice, he proceeds thus: "The ends propofed by our dramatic poets (or by poets in general) are, to pleafe, to inftruct, or to do both. When inftruction is your aim, let your moral fentences be expreffed with brevity, that they may be readily underftood, and long remembered: where you mean to pleafe, let your fictions be conformable to truth or probability. The elder part of your audience (or readers) have no relifh for poems that give pleafure only without inftruction; nor the younger for fuch writings as give inftruction without pleafure. He only can fecure the univerfal fuffrage in his favour, who blends the ufeful with the agreeable, and delights at the fame time that he inftructs the reader. Such are the works that bring money to the bookfeller, that pafs into foreign countries, and perpetuate the author's name through a long fucceffion of ages †."—Now, what is the meaning of all this? What, but that to the *perfection* of dramatic poetry (or, if you pleafe, of poetry in general) both found morals and beautiful fiction are requifite? But Horace never meant to fay, that inftruction, as well as pleafure, is neceffary to give to any compofition the *poetical character*; or he would not in another place have celebrated with fo much affection and rapture the melting ftrains of Sappho, and the playful genius of Anacreon ‡,—two authors tranfcendently fweet, but not remarkably inftructive. We are fure, that pathos, and harmony, and elevated language, were, in Horace's opinion, effential to poetry §; and of thefe decorations nobody will affirm that inftruction is the end, who confiders that the moft inftructive books in the world are written in plain profe.

† Hor. Ar. Poet. 333.—347.

‡ Hor. Carm. lib. iv. ode 9.

§ Hor. Sat. lib. i. fat. 4. ver. 40.

In fhort, our author has endeavoured by many ingenious arguments and illuftrations to eftablifh it as a truth in criticifm, that the end of poetry is *to pleafe*. Verfes, if pleafing, may be poetical, though they convey little or no inftruction; but verfes, whofe fole merit it is that they convey inftruction, are not poetical. Inftruction, however, he admits, efpecially in poems of length, is neceffary to their *perfection*, becaufe they would not be *perfectly agreeable* without it.

SECT. II. *Of the Standard of Poetical Invention.*

6 Poetical invention to be regulated

HOMER's beautiful defcription of the heavens and earth, as they appear in a calm evening by the light of the moon and ftars, concludes with this circumftance, "And the heart of the fhepherd is glad *." Madame Dacier, from the turn fhe gives to the paffage in her verfion, feems to think, and Pope, in order perhaps to make out his couplet, infinuates, that the gladnefs of the fhepherd is owing to his fenfe of the utility of thofe luminaries. And this may in part be the cafe: but this is not in Homer; nor is it a neceffary confideration. It is true, that, in contemplating the material univerfe, they who difcern the caufes and effects of things muft be more rapturoufly entertained than thofe who perceive nothing but fhape and fize, colour and motion. Yet, in the mere outfide of Nature's work, there is a fplendour and a magnificence to which even untutored minds cannot attend without great delight.

* Iliad, viii. 555.

Beattie's Effays, Part i. chap. 2.

Not that all peafants or all philofophers are equally fufceptible of thefe charming impreffions. It is ftrange to obferve the calloufnefs of fome men, before whom all the glories of heaven and earth pafs in daily fucceffion, without touching their hearts, elevating their fancy, or leaving any durable remembrance. Even of thofe who pretend to fenfibility, how many are there to whom the luftre of the rifing or fetting fun; the fparkling concave of the midnight fky; the mountain-foreft toffing and roaring to the ftorm, or warbling with all the melodies of a fummer evening; the fweet interchange of hill and dale, fhade and funfhine, grove, lawn, and water, which an extenfive landfcape offers to the view; the fcenery of the ocean, fo lovely, fo majeftic, and fo tremendous; and the many pleafing varieties of the animal and vegetable kingdoms, could never afford fo much real fatisfaction, as the fteams and noife of a ball-room, the infipid fiddling and fqueaking of an opera, or the vexations and wranglings of a card-table!

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But fome minds there are of a different make; who, even in the early part of life, receive from the contemplation of Nature a fpecies of delight which they would hardly exchange for any other, and who, as avarice and ambition are not the infirmities of that period, would, with equal fincerity and rapture, exclaim,

> I care not, Fortune, what you me deny;
> You cannot rob me of free Nature's grace;
> You cannot fhut the windows of the fky,
> Through which Aurora fhows her bright'ning face;
> You cannot bar my conftant feet to trace
> The woods and lawns by living ftream at eve.
>
> *Caftle of Indolence.*

Such minds have always in them the feeds of true tafte, and frequently of imitative genius. At leaft, though their enthufiaftic or vifionary turn of mind (as the man of the world would call it) fhould not always incline them to practife poetry or painting, we need not fcruple to affirm, that without fome portion of this enthufiafm no perfon ever became a true poet or painter. For he who would imitate the works of nature, muft firft accurately obferve them; and accurate obfervation is to be expected from thofe only who take great pleafure in it.

To a mind thus difpofed no part of creation is indifferent. In the crowded city and howling wildernefs; in the cultivated province and folitary ifle; in the flowery lawn and craggy mountain; in the murmur of the rivulet and in the uproar of the ocean; in the radiance of fummer and gloom of winter; in the thunder of heaven and in the whifper of the breeze; he ftill finds fomething to rouze or to footbe his imagination, to draw forth his affections, or to employ his underftanding. And from every mental energy that is not attended with pain, and even from fome of thofe that are, as moderate terror and pity, a found mind derives fatisfaction; exercife being equally neceffary to the body and the foul, and to both equally productive of health and pleafure.

This happy fenfibility to the beauties of nature fhould be cherifhed in young perfons. It engages them to contemplate the Creator in his wonderful works; it purifies and harmonizes the foul, and prepares it for moral and intellectual difcipline; it fupplies an endlefs fource of amufement; it contributes even to bodily health: and, as a ftrict analogy fubfifts between material and moral beauty, it leads the heart by an eafy tranfition from the one to the other; and thus recommends virtue for its tranfcendant lovelinefs, and makes vice appear the object

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object of contempt and abomination. An intimate acquaintance with the best descriptive poets, Spenser, Milton, and Thomson, but above all with the divine Georgic, joined to some practice in the art of drawing, will promote this amiable sensibility in early years: for then the face of nature has novelty superadded to its other charms, the passions are not pre-engaged, the heart is free from care, and the imagination warm and romantic.

7 by the standard of nature.

But not to insist longer on those ardent emotions that are peculiar to the enthusiastic disciple of nature, may it not be affirmed of all men, without exception, or at least of all the enlightened part of mankind, that they are gratified by the contemplation of things natural, as opposed to unnatural? Monstrous sights please but for a moment, if they please at all; for they derive their charm from the beholder's amazement, which is quickly over. We read indeed of a man of rank in Sicily *, who chooses to adorn his villa with pictures and statues of most unnatural deformity: but it is a singular instance; and one would not be much more surprised to hear of a person living without food, or growing fat by the use of poison. To say of any thing, that it is *contrary to nature*, denotes censure and disgust on the part of the speaker; as the epithet *natural* intimates an agreeable quality, and seems for the most part to imply that a thing is as it ought to be, suitable to our own taste, and congenial with our own constitution. Think with what sentiments we should peruse a poem, in which nature was totally misrepresented, and principles of thought and of operation supposed to take place, repugnant to every thing we had seen or heard of:—in which, for example, avarice and coldness were ascribed to youth, and prodigality and passionate attachment to the old; in which men were made to act at random, sometimes according to character, and sometimes contrary to it; in which cruelty and envy were productive of love, and beneficence and kind affection of hatred: in which beauty was invariably the object of dislike, and ugliness of desire; in which society was rendered happy by atheism and the promiscuous perpetration of crimes, and justice and fortitude were held in universal contempt. Or think, how we should relish a painting, where no regard was had to the proportions, colours, or any of the physical laws, of Nature:—where the ears and eyes of animals were placed in their shoulders; where the sky was green and the grass crimson; where trees grew with their branches in the earth and their roots in the air; where men were seen fighting after their heads were cut off, ships sailing on the land, lions entangled in cobwebs, sheep preying on dead carcases, fishes sporting in the woods, and elephants walking on the sea. Could such figures and combinations give pleasure, or merit the appellation of sublime or beautiful? Should we hesitate to pronounce their author mad? And are the absurdities of madmen proper subjects either of amusement or of imitation to reasonable beings?

* Brydone's Tour in Sicily, let. 24.

Let it be remarked, too, that though we distinguish our internal powers by different names, because otherwise we could not speak of them so as to be understood, they are all but so many energies of the same individual mind; and therefore it is not to be supposed, that what contradicts any one leading faculty should yield permanent delight to the rest. That cannot be agreeable to reason, which conscience disapproves; nor can that gratify imagination, which is repugnant to reason.——Besides, belief and acquiescence of mind are pleasant, as distrust and disbelief are painful: and therefore, that only can give solid and general satisfaction, which has something of plausibility in it; something which we conceive it possible for a rational being to believe. But no rational being can acquiesce in what is obviously contrary to nature, or implies palpable absurdity.

Poetry, therefore, and indeed every art whose end is to please, must be natural; and if so, must exhibit real matter of fact, or something like it; that is, in other words, must be either according to truth or according to verisimilitude.

And though every part of the material universe abounds in objects of pleasurable contemplation, yet nothing in nature so powerfully touches our hearts, or gives so great variety of exercise to our moral and intellectual faculties, as man. Human affairs and human feelings are universally interesting. There are many who have no great relish for the poetry that delineates only irrational or inanimate beings; but to that which exhibits the fortunes, the characters, and the conduct of men, there is hardly any person who does not listen with sympathy and delight. And hence to imitate human action, is considered by Aristotle as essential to this art; and must be allowed to be essential to the most pleasing and most instructive part of it, Epic and Dramatic composition. Mere descriptions, however beautiful, and moral reflections, however just, become tiresome, where our passions are not occasionally awakened by some event that concerns our fellow-men. Do not all readers of taste receive peculiar pleasure from those little tales or episodes with which Thomson's descriptive poem on the Seasons is here and there enlivened? and are they not sensible, that the thunder-storm would not have been half so interesting without the tale of the two lovers (*Summer*, v. 1171); nor the harvest-scene, without that of Palemon and Lavinia (*Autumn*, v. 177.); nor the driving snows, without that exquisite picture of a man perishing among them (*Winter*, v. 276.)? It is much to be regretted, that Young did not employ the same artifice to animate his Night Thoughts. Sentiments and descriptions may be regarded as the pilasters, carvings, gildings, and other decorations of the poetical fabric: but human actions are the columns and the rafters that give it stability and elevation. Or, changing the metaphor, we may consider these as the soul which informs the lovely frame; while those are little more than the ornaments of the body.

Whether the pleasure we take in things natural, and our dislike to what is the reverse, be the effect of habit or of constitution, is not a material inquiry. There is nothing absurd in supposing, that between the soul, in its first formation, and the rest of nature, a mutual harmony and sympathy may have been established, which experience may indeed confirm, but no perverse habits could entirely subdue. As no sort of education could make man believe the contrary of a self-evident axiom, or reconcile him to a life of perfect solitude; so we should imagine, that our love of nature and regularity might still remain with us in some degree, though we had been born and bred in the Sicilian villa above mentioned, and never heard any thing applauded but what deserved censure, nor censured but what merited applause. Yet habit must be allowed to have a powerful influence over the

8 Habit has great influence over sentiment and feeling, and of course upon poetry.

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the sentiments and feelings of mankind; for, objects to which we have been long accustomed, we are apt to contract a fondness: we conceive them readily, and contemplate them with pleasure; nor do we quit our old tracts of speculation or practice without reluctance and pain. Hence in part arises our attachment to our own professions, our old acquaintance, our native soil, our homes, and to the very hills, streams, and rocks in our neighbourhood. It would therefore be strange, if man, accustomed as he is from his earliest days to the regularity of nature, did not contract a liking to her productions and principles of operation.

9
No necessity that the poet should exactly copy nature.

Yet we neither expect nor desire, that every human invention, where the end is only to please, should be an exact transcript of real existence. It is enough, that the mind acquiesce in it as probable or plausible, or such as we think might happen without any direct opposition to the laws of nature:—Or, to speak more accurately, it is enough that it be consistent, either, first, with general experience; or, secondly, with popular opinion; or thirdly, that it be consistent with itself, and connected with probable circumstances.

First: If a human invention be consistent with *general* experience, we acquiesce in it as sufficiently probable. *Particular* experiences, however, there may be, so uncommon, and so little expected, that we should not admit their probability, if we did not know them to be true. No man of sense believes, that he has any likelihood of being enriched by the discovery of hidden treasure; or thinks it probable, on purchasing a lottery-ticket, that he shall gain the first prize; and yet great wealth has actually been acquired by such good fortune. But we should look upon these as poor expedients in a play or romance for bringing about a happy catastrophe. We expect that fiction should be more consonant to the general tenor of human affairs; in a word, that not possibility, but probability, should be the standard of poetical invention.

10
Fiction sufficiently conformable to nature when it accords with received opinions,

Secondly: Fiction is admitted as conformable to this standard, when it accords with received opinions. These may be erroneous, but are not often *apparently* repugnant to nature. On this account, and because they are familiar to us from our infancy, the mind readily acquiesces in them, or at least yields them that degree of credit which is necessary to render them pleasing: hence the fairies, ghosts, and witches of Shakespeare, are admitted as probable beings: and angels obtain a place in religious pictures, though we know that they do not now appear in the scenery of real life. A poet who should at this day make the whole action of his tragedy depend upon enchantment, and produce the chief events by the assistance of supernatural agents, would indeed be censured as transgressing the bounds of probability, be banished from the theatre to the nursery, and condemned to write fairy tales instead of tragedies. But Shakespeare was in no danger of such censures: In his days the doctrine of witchcraft was established both by law and by the fashion; and it was not only unpolite, but criminal, to doubt it. Now indeed it is admitted only by the vulgar; but it does not therefore follow that an old poem built upon it should not be acceptable to the learned themselves. When a popular opinion has long been exploded, and has become repugnant to philosophical belief, the fictions built upon it are still admitted as natural, both because we all remember to have listened to them in childhood with some degree of credit, and because we know that they were accounted natural by the people to whom they were first addressed; whose sentiments and views of things we are willing to adopt, when, by the power of pleasing description, we are introduced into their scenes, and made acquainted with their manners. Hence we admit the theology of the ancient poets, their Elysium and Tartarus, Scylla and Charybdis, Cyclops and Circe, and the rest of those "beautiful wonders" (as Horace calls them) which were believed in the heroic ages; as well as the demons and enchantments of Tasso, which may be supposed to have obtained no small degree of credit among the Italians of the 16th century, and are suitable enough to the notions that prevailed universally in Europe not long before (A). In fact, when poetry is in other respects true, when it gives an accurate display of those parts of nature about which we know that men in all ages must have entertained the same opinion, namely, those appearances in the visible creation, and those feelings and workings of the human mind, which are obvious to all mankind;—when poetry is thus far according to nature, we are very willing to be indulgent to what is fictitious in it, and to grant a temporary allowance to any system of fable which the author pleases to adopt; provided that he lay the scene in a distant country, or fix the date to a remote period. This is no unreasonable piece of complaisance; we owe it both to the poet and to ourselves; for without it we should neither form a right estimate of his genius, nor receive from his works that pleasure which they were intended to impart. Let him, however, take care, that his system of fable be such as his countrymen and cotemporaries (to whom his work is immediately addressed) might be supposed capable of yielding their assent to; for otherwise we should not believe him to be in earnest: and let him connect it as much as he can with probable circumstances, and make it appear in a series of events consistent with itself.

For (thirdly) if this be the case, we shall admit his story as probable, or at least as natural, and consequently be interested in it, even though it be not warranted by general experience, and derive but slender authority from popular opinion. Calyban, in the Tempest, would have shocked the mind as an improbability, if we had not been made acquainted with his origin, and seen his character displayed in a series of consistent behaviour. But when we are told that he sprung from a witch and a demon, a connection not contrary to the laws of nature, as they were understood in Shakespeare's time, and find his manners conformable to his descent, we are easily reconciled to the fiction. In the same sense, the Lilliputians of

(A) In the 14th century, the common people of Italy believed that the poet Dante went down to hell; that the *Inferno* was a true account of what he saw there; and that his sallow complexion, and stunted beard (which seemed by its growth and colour to have been too near the fire), were the consequence of his passing so much of his time in that hot and smoky region. See *Vicende della Literatura del Sig. C. Denina*, cap. 4.

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11 and is conſiſtent with itſelf.

of Swift may paſs for probable beings; not ſo much becauſe we know that a belief in pigmies was once current in the world (for the true ancient pigmy was at leaſt thrice as tall as thoſe whom Gulliver viſited), but becauſe we find that every circumſtance relating to them accords with itſelf, and with their ſuppoſed character. It is not the ſize of the people only that is diminutive; their country, ſeas, ſhips, and towns, are all in exact proportion; their theological and political principles, their paſſions, manners, cuſtoms, and all the parts of their conduct, betray a levity and littleneſs perfectly ſuitable: and ſo ſimple is the whole narration, and apparently ſo artleſs and ſincere, that we ſhould not much wonder if it had impoſed (as we have been told it has) upon ſome perſons of no contemptible underſtanding. The ſame degree of credit may perhaps for the ſame reaſons be due to his giants. But when he grounds his narrative upon a contradiction to nature; when he preſents us with rational brutes, and irrational men; when he tells us of horſes building houſes for habitation, milking cows for food, riding in carriages, and holding converſations on the laws and politics of Europe: not all his genius (and he there exerts it to the utmoſt) is able to reconcile us to ſo monſtrous a fiction: we may ſmile at ſome of his abſurd exaggerations; we may be pleaſed with the energy of ſtyle, and accuracy of deſcription, in particular places; and a malevolent heart may triumph in the ſatire; but we can never reliſh it as a fable, becauſe it is at once unnatural and ſelf-contradictory. Swift's judgment ſeems to have forſaken him on this occaſion: he wallows in naſtineſs and brutality: and the general run of his ſatire is downright defamation. Lucian's *True Hiſtory*, is a heap of extravagancies put together without order or unity, or any other apparent deſign than to ridicule the language and manner of grave authors. His ravings, which have no better right to the name of *fable*, than a hill of rubbiſh has to that of palace, are deſtitute of every colour of plauſibility. Animal trees, ſhips ſailing in the ſky, armies of monſtrous things travelling between the ſun and moon on a pavement of cobwebs, rival nations of men inhabiting woods and mountains in a whale's belly,—are liker the dreams of a bedlamite than the inventions of a rational being.

Beattie's Eſſays, ut ſupra.

12 A ſtricter probability requiſite in ſome kinds of poetry than in others.

If we were to proſecute this ſubject any farther, it would be proper to remark, that in ſome kinds of poetical invention a ſtricter probability is required than in others:—that, for inſtance, Comedy, whether dramatic or narrative (B), muſt ſeldom deviate from the ordinary courſe of human affairs, becauſe it exhibits the manners of real and even of familiar life:—that the tragic poet, becauſe he imitates characters more exalted, and generally refers to events little known, or long ſince paſt, may be allowed a wider range: but muſt never attempt the marvellous fictions of the epic muſe, becauſe he addreſſes his work, not only to the paſſions and imagination of mankind, but alſo to their eyes and ears, which are not eaſily impoſed on, and refuſe to be gratified with any repreſentation that does not come very near the truth:—that the epic poem may claim ſtill ampler privileges, becauſe its fictions are not ſubject to the ſcrutiny of any outward ſenſe, and becauſe it conveys information in regard both to the higheſt human characters, and the moſt important and wonderful events, and alſo to the affairs of unſeen worlds and ſuperior beings. Nor would it be improper to obſerve, that the ſeveral ſpecies of comic, of tragic, of epic compoſition, are not confined to the ſame degree of probability: for that farce may be allowed to be leſs probable than the regular comedy; the maſque than the regular tragedy; and the mixed epic, ſuch as the Fairy Queen, and Orlando Furioſo, than the pure epopee of Homer, Virgil, and Milton. But this part of the ſubject ſeems not to require further illuſtration. Enough has been ſaid to ſhow, that nothing unnatural can pleaſe; and that therefore poetry, whoſe end is to pleaſe, muſt be *according to nature*.

And if ſo, it muſt be either according to real nature, or according to nature ſomewhat different from the reality.

SECT. III. *Of the Syſtem of Nature exhibited by Poetry.*

To exhibit *real nature* is the buſineſs of the hiſtorian; who, if he were ſtrictly to confine himſelf to his own ſphere, would never record even the minuteſt circumſtance of any ſpeech, event, or deſcription, which was not warranted by ſufficient authority. It has been the language of critics in every age, that the hiſtorian ought to relate nothing as true which is falſe or dubious, and to conceal nothing material which he knows to be true. But it is to be doubted whether any writer of profane hiſtory has ever been ſo ſcrupulous. Thucydides himſelf, who began his hiſtory when that war began which he records, and who ſet down every event ſoon after it happened, according to the moſt authentic information, ſeems, however, to have indulged his fancy not a little in his harangues and deſcriptions, particularly that of the plague of Athens: and the ſame thing has been practiſed, with greater latitude, by Livy and Tacitus, and more or leſs by all the beſt hiſtorians both ancient and modern. Nor are they to be blamed for it. By theſe improved or invented ſpeeches, and by the heightenings thus given to their deſcriptions, their work becomes more intereſting, and more uſeful; nobody is deceived, and hiſtorical truth is not materially affected. A medium is, however, to be obſerved in this, as in other things. When the hiſtorian lengthens a deſcription into a detail of fictitious events, as Voltaire has done in his account of the battle of Fontenoy, he loſes his credit with us, by raiſing a ſuſpicion that he is more intent upon a pretty ſtory than upon the truth. And we are diſguſted with his inſincerity, when, in defiance even of veriſimilitude, he puts long elaborate orations in the mouth of thoſe, of whom we know, either from the circumſtances that they could not, or from more authentic records that they did not, make any ſuch orations; as Dionyſius of Halicarnaſſus has done in the caſe of Volumnia haranguing her ſon Coriolanus, and Flavius Joſephus in that of Judah addreſſing his brother as viceroy of Egypt. From what theſe hiſtorians relate, one would conjecture

13 Hiſtorians embelliſh their works by fiction, and make them

(B) Fielding's *Tom Jones*, *Amelia*, and *Joſeph Andrews*, are examples of what may be called the *Epic* or *Narrative Comedy*, or more properly perhaps the *Comic Epopee*.

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conjecture that the Roman matron had ftudied at Athens under fome long-winded rhetorician, and that the Jewifh patriarch muft have been one of the moft flowery orators of antiquity. But the fictitious part of hiftory, or of ftory-telling, ought never to take up much room; and muft be highly blameable when it leads into any miftake either of facts or of characters.

14 in fome degree poetical.

Now, why do hiftorians take the liberty to embellifh their works in this manner? One reafon, no doubt, is, that they may difplay their talents in oratory and narration: but the chief reafon, as hinted already, is, to render their compofition more agreeable. It would feem, then, that fomething more pleafing than real nature, or fomething which fhall add to the pleafing qualities of real nature, may be devifed by human fancy. And this may certainly be done. And this it is the poet's bufinefs to do. And when this is in any degree done by the hiftorian, his narrative becomes in that degree poetical.

Beattie's *Effays*, chap. ii.

The poffibility of thus improving upon nature muft be obvious to every one. When we look at a landfcape, we can fancy a thoufand additional embellifhments. Mountains loftier and more picturefque; rivers more copious, more limpid, and more beautifully winding; fmoother and wider lawns; valleys more richly diverfified; caverns and rocks more gloomy and more ftupendous; ruins more majeftic; buildings more magnificent; oceans more varied with iflands, more fplendid with fhipping, or more agitated by ftorm, than any we have ever feen—it is eafy for human imagination to conceive. Many things in art and nature exceed expectation; but nothing fenfible tranfcends or equals the capacity of thought:—a ftriking evidence of the dignity of the human foul! The fineft woman in the world appears to every eye fufceptible of improvement, except perhaps to that of her lover. No wonder, then, if in poetry events can be exhibited more compact, and of more pleafing variety, than thofe delineated by the hiftorian, and fcenes of inanimate nature more dreadful or more lovely, and human characters more fublime and more exquifite, both in good and evil. Yet ftill let nature fupply the ground-work and materials, as well as the ftandard, of poetical fiction. The moft expert painters ufe a layman, or other vifible figure, to direct their hand and regulate their fancy. Homer himfelf founds his two poems on authentic tradition; and tragic as well epic poets have followed the example. The writers of romance, too, are ambitious to interweave true adventures with their fables; and when it can be conveniently done, to take the outlines of their plan from real life. Thus the tale of Robinfon Crufoe is founded on an incident that actually befel one Alexander Selkirk, a feafaring man, who lived feveral years alone in the ifland of Juan Fernandes: Smollet is thought to have given us feveral of his own adventures in the hiftory of Roderic Random; and the chief characters in Tom Jones, Jofeph Andrews, and Pamela, are faid to have been copied from real originals. Dramatic comedy, indeed, is for the moft part purely fictitious: for if it were to exhibit real events as well as prefent manners, it would become too perfonal to be endured by a well-bred audience, and degenerate into downright abufe; which appears to have been the cafe with the old comedy of the Greeks *. But in general, hints taken from real exiftence will be found to give no little grace and ftability to fiction, even in the moft fanciful poem. Thefe hints, however, may be improved by the poet's imagination, and fet off with every probable ornament that can be devifed, confiftently with the defign and genius of the work; or in other words, with the fympathies that the poet means to awaken in the mind of his reader. For mere poetical ornament, when it fails to intereft the affections, is not only ufelefs, but improper; all true poetry being addreffed to the heart, and intended to give pleafure by raifing or foothing the paffions;—the only effectual way of pleafing a rational and moral creature. And therefore we would take Horace's maxim to be univerfal in poetry: "*Non fatis eft, pulchra effe poemata*; dulcia *funto*:" "It is not enough that poems be beautiful; let them alfo be *affecting*:"— For that this is the meaning of the word *dulcia* in this place, is admitted by the beft interpreters, and is indeed evident from the context †.

15 Poets embellifh nature itfelf,

* Compare *Hor.* lib. i. fat. 4. verf. 1.—5. with *Ar. Poet.* verf. 281.—285.

† *Hor. Ar. Poet.* verf. 95.—100.

16 and defcribe even things inanimate fo as to make them affecting.

That the fentiments and feelings of percipient beings when expreffed in poetry, fhould call forth our affections, is natural enough; but can defcriptions of inanimate things alfo be made affecting? Certainly they can: and the more they affect, the more they pleafe us, and the more poetical we allow them to be. Virgil's Georgic is a noble fpecimen (and indeed the nobleft in the world) of this fort of poetry. His admiration of external nature gains upon a reader of tafte, till it rife to perfect enthufiafm. The following obfervations will perhaps explain this matter.

Every thing in nature is complex in itfelf, and bears innumerable relations to other things; and may therefore be viewed in an endlefs variety of lights, and confequently defcribed in an endlefs variety of ways. Some defcriptions are good, and others bad. An hiftorical defcription, that enumerates all the qualities of any object, is certainly good, becaufe it is true; but may be as unaffecting as a logical definition. In poetry, no unaffecting defcription is good, however conformable to truth: for here we expect not a complete enumeration of qualities (the chief end of the art being to pleafe), but only fuch an enumeration as may give a lively and interefting idea. It is not memory, or the knowledge of rules, that can qualify a poet for this fort of defcription; but a peculiar livelinefs of fancy and fenfibility of heart, the nature whereof we may explain by its effects, but we cannot lay down rules for the attainment of it.

17 Every perfon introduced in poetry fhould fee things through the medium of his ruling paffion.

When our mind is occupied by any emotion, we naturally ufe words and meditate on things that are fuitable to it and tend to encourage it. If a man were to write a letter when he is very angry, there would probably be fomething of vehemence or bitternefs in the ftyle, even though the perfon to whom he wrote were not the object of his anger. The fame thing holds true of every other ftrong paffion or emotion:—while it predominates in the mind, it gives a peculiarity to our thoughts, as well as to our voice, gefture, and countenance: And hence we expect, that every perfonage introduced in poetry fhould fee things through the medium of his ruling paffion, and that his thoughts and language fhould be tinctured accordingly. A melancholy man walking in a grove, attends to thofe things that fuit and encourage his melancholy; the fighing of the wind in the trees, the murmuring of waters, the darknefs and folitude of the fhades: A cheerful man in the

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the ſame place, finds many ſubjects of cheerful meditations, in the ſinging of birds, the briſk motions of the babbling ſtream, and the livelineſs and variety of the verdure. Perſons of different characters, contemplating the ſame thing, a Roman triumph, for inſtance, feel different emotions, and turn their view to different objects. One is filled with wonder at ſuch a diſplay of wealth and power; another exults in the idea of conqueſt, and pants for military renown; a third, ſtunned with clamour, and haraſſed with confuſion, wiſhes for ſilence, ſecurity, and ſolitude; one melts with pity to the vanquiſhed, and makes many a ſad reflection upon the inſignificance of worldly grandeur, and the uncertainty of human things; while the buffoon, and perhaps the philoſopher, conſiders the whole as a vain piece of pageantry, which, by its ſolemn procedure, and by the admiration of ſo many people, is only rendered the more ridiculous:—and each of theſe perſons would deſcribe it in a way ſuitable to his own feelings, and tending to raiſe the ſame in others. We ſee in Milton's Allegro and Penſeroſo, how a different caſt of mind produces a variety in the manner of conceiving and contemplating the ſame rural ſcenery. In the former of theſe excellent poems, the author perſonates a cheerful man, and takes notice of thoſe things in external nature that are ſuitable to cheerful thoughts, and tend to encourage them: in the latter, every object deſcribed is ſerious and ſolemn, and productive of calm reflection and tender melancholy; and we ſhould not be eaſily perſuaded, that Milton wrote the firſt under the influence of ſorrow, or the ſecond under that of gladneſs. We often ſee an author's character in his works; and if every author were in earneſt when he writes, we ſhould oftener ſee it. Thomſon was a man of piety and benevolence, and a warm admirer of the beauties of nature; and every deſcription in his delightful poem on the Seaſons tends to raiſe the ſame laudable affections in his reader. The parts of nature that attract his notice are thoſe which an impious or hard-hearted man would neither attend to, nor be affected with, at leaſt in the ſame manner. In Swift we ſee a turn of mind very different from that of the amiable Thomſon; little reliſh for the ſublime or beautiful, and a perpetual ſucceſſion of violent emotions. All his pictures of human life ſeem to ſhow, that deformity and meanneſs were the favourite objects of his attention, and that his ſoul was a conſtant prey to indignation (c), diſguſt, and other gloomy paſſions, ariſing from ſuch a view of things. And it is the tendency of almoſt all his writings (though it was not always the author's deſign), to communicate the ſame paſſions to his reader: inſomuch, that notwithſtanding his erudition and knowledge of the world, his abilities as a popular orator and man of buſineſs, the energy of his ſtyle, the elegance of ſome of his verſes, and his extraordinary talents in wit and humour, there is reaſon to doubt, whether by ſtudying his works any perſon was very much improved in piety or benevolence.

Beattie's Eſſays, ut ſupra.

And thus we ſee, how the compoſitions of an ingenious author may operate upon the heart, whatever be the ſubject. The affections that prevail in the author himſelf, direct his attention to objects congenial, and give a peculiar bias to his inventive powers, and a peculiar colour to his language. Hence his work, as well as face, if nature is permitted to exert herſelf freely in it, will exhibit a picture of his mind, and awaken correſpondent ſympathies in the reader. When theſe are favourable to virtue, which they always ought to be, the work will have that ſweet pathos to which Horace alludes in the paſſage above mentioned; and which we ſo highly admire, and ſo warmly approve, even in thoſe parts of the Georgic that deſcribe inanimate nature.

18 It is thus that poetry affects the heart whatever be its ſubject.

Horace's account of the matter in queſtion differs not from what is here given. "It is not enough (ſays he*) that poems be beautiful; let them be affecting, and agitate the mind with whatever paſſions the poet wiſhes to impart. The human countenance, as it ſmiles on thoſe who ſmile, accompanies alſo with ſympathetic tears thoſe who mourn. If you would have me weep, you muſt firſt weep yourſelf; then, and not before, ſhall I be touched with your misfortunes.—For nature firſt makes the emotions of our mind correſpond with our circumſtances, infuſing real joy, ſorrow, or reſentment, according to the occaſion; and afterwards gives the true pathetic utterance to the voice and language." This doctrine, which concerns the orator and the player no leſs than the poet, is ſtrictly philoſophical, and equally applicable to dramatic, to deſcriptive, and indeed to every ſpecies of intereſting poetry. The poet's ſenſibility muſt firſt of all engage him warmly in his ſubject, and in every part of it; otherwiſe he will labour in vain to intereſt the reader. If he would paint external nature, as Virgil and Thomſon have done, ſo as to make her amiable to others, he muſt firſt be enamoured of her himſelf; if he would have his heroes and heroines ſpeak the language of love or ſorrow, devotion or courage, ambition or anger, benevolence or pity, his heart muſt be ſuſceptible of thoſe emotions, and in ſome degree feel them, as long at leaſt as he employs himſelf in framing words for them; being aſſured, that

* *Ar. Poet.* v. 99.—111.

> He beſt ſhall paint them who can feel them moſt.
>
> POPE's *Eloiſa*, v. 366.

19 The true poet, therefore, muſt not only ſtudy nature, and know the reality of things, but muſt alſo poſſeſs fancy, to invent additional decorations; judgment, to direct him in the choice of ſuch as accord with veriſimilitude; and ſenſibility, to enter with ardent emotions into every part of his ſubject, ſo as to transfuſe into every part of his work a pathos and energy ſufficient to raiſe correſponding emotions in the reader.

The true poet muſt poſſeſs fancy to invent decorations to nature.

"The hiſtorian and the poet (ſays Ariſtotle*) differ in this, that the former exhibits things as they are, the latter as they might be;"—*i. e.* in that ſtate of perfection which is conſiſtent with probability, and in which, for the ſake of our own gratification, we wiſh to find them. If the poet, after all the liberties he is allowed to take with the truth, can produce nothing more exquiſite than is commonly to be met with in hiſtory, his reader

* *Poetic.* ſect. 5.

(c) For part of this remark we have his own authority, often in his letters, and very explicitly in the Latin epitaph which he compoſed for himſelf:—"ubi ſæva indignatio ulterius cor lacerare nequit." *See his laſt will and teſtament.*

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reader will be diſappointed and diſſatisfied. Poetical repreſentations muſt therefore be framed after a pattern of the higheſt probable perfection that the genius of the work will admit:—external nature muſt in them be more picturesque than in reality; action more animated; ſentiments more expreſſive of the feelings and character, and more ſuitable to the circumſtances of the ſpeaker; perſonages better accompliſhed in thoſe qualities that raiſe admiration, pity, terror, and other ardent emotions; and events more compact, more clearly connected with cauſes and conſequences, and unfolded in an order more flattering to the fancy, and more intereſting to the paſſions. But where, it may be ſaid, is this pattern of perfection to be found? Not in real nature; otherwiſe hiſtory, which delineates real nature, would alſo delineate this pattern of perfection. It is to be found only in the mind of the poet; and it is imagination, regulated by knowledge, that enables him to form it.

In the beginning of life, and while experience is confined to a ſmall circle, we admire every thing, and are pleaſed with very moderate excellence. A peaſant thinks the hall of his landlord the fineſt apartment in the univerſe, liſtens with rapture to the ſtrolling ballad-ſinger, and wonders at the rude wooden cuts that adorn his ruder compoſitions. A child looks upon his native village as a town; upon the brook that runs by as a river; and upon the meadows and hills in the neighbourhood as the moſt ſpacious and beautiful that can be. But when, after long abſence, he returns in his declining years, to viſit, once before he die, the dear ſpot that gave him birth, and thoſe ſcenes whereof he remembers rather the original charms than the exact proportions; how is he diſappointed to find every thing ſo debaſed and ſo diminiſhed! The hills ſeem to have ſunk into the ground, the brook to be dried up, and the village to be forſaken of its people; the pariſh-church, ſtripped of all its fancied magnificence, is become low, gloomy, and narrow; and the fields are now only the miniature of what they were. Had he never left this ſpot, his notions might have remained the ſame as at firſt; and had he travelled but a little way from it, they would not perhaps have received any material enlargement. It ſeems then to be from obſervation of many things of the ſame or ſimilar kinds, that we acquire the talent of forming ideas more perfect than the real objects that lie immediately around us: and theſe ideas we may improve gradually more and more, according to the vivacity of our mind, and extent of our experience, till at laſt we come to raiſe them to a degree of perfection ſuperior to any thing to be found in real life. There cannot ſure be any myſtery in this doctrine; for we think and ſpeak to the ſame purpoſe every day. Thus nothing is more common than to ſay, that ſuch an artiſt excels all we have ever known in his profeſſion, and yet that we can ſtill conceive a ſuperior performance. A moraliſt, by bringing together into one view the ſeparate virtues of many perſons, is enabled to lay down a ſyſtem of duty more perfect than any he has ever ſeen exemplified in human conduct. Whatever be the emotion the poet intends to raiſe in his reader, whether admiration or terror, joy or ſorrow; and whatever be the object he would exhibit, whether Venus or Tiſiphone, Achilles or Therſites, a palace or a pile of ruins, a dance or a battle; he generally copies an idea of his own imagination; conſidering each quality as it is

20 Obſervation of many things of the ſame kind a great help to poetical fancy, becauſe

found to exiſt in ſeveral individuals of a ſpecies, and thence forming an aſſemblage more or leſs perfect in its kind, according to the purpoſe to which he means to apply it.

21 Poetical conceptions muſt be general,

Hence it would appear, that the ideas of poetry are rather general than ſingular; rather collected from the examination of a ſpecies or claſs of things, than copied from an individual. And this, according to Ariſtotle, is in fact the caſe, at leaſt for the moſt part; whence that critic determines, that poetry is ſomething more exquiſite and more philoſophical than hiſtory *. The hiſtorian may deſcribe Bucephalus, but the poet delineates a war-horſe; the former muſt have ſeen the animal he ſpeaks of, or received authentic information concerning it, if he mean to deſcribe it hiſtorically; for the latter, it is enough that he has ſeen ſeveral animals of that ſort. The former tells us, what Achilles actually did and ſaid; the latter, what ſuch a ſpecies of human character as that which bears the name of Achilles would probably do or ſay in certain given circumſtances.

It is indeed true, that the poet may, and often does, copy after individual objects. Homer, no doubt, took his characters from the life; or at leaſt, in forming them, was careful to follow tradition as far as the nature of his plan would allow. But he probably took the freedom to add or heighten ſome qualities, and take away others; to make Achilles, for example, ſtronger, perhaps, and more impetuous, and more eminent for filial affection, and Hector more patriotic and more amiable than he really was. If he had not done this, or ſomething like it, his work would have been rather a hiſtory than a poem; would have exhibited men and things as they were, and not as they might have been; and *Achilles* and *Hector* would have been the names of individual and real heroes; whereas, according to Ariſtotle, they are rather to be conſidered as two diſtinct modifications or ſpecies of the heroic character. Shakeſpeare's account of the cliffs of Dover comes ſo near the truth, that we cannot doubt of its having been written by one who had ſeen them: but he who takes it for an exact hiſtorical deſcription, will be ſurpriſed when he comes to the place, and finds thoſe cliffs not half ſo lofty as the poet had made him believe. An hiſtorian would be to blame for ſuch amplification; becauſe, being to deſcribe an individual precipice, he ought to tell us juſt what it is; which if he did, the deſcription would ſuit that place, and perhaps no other in the whole world. But the poet means only to give an idea of what ſuch a precipice may be; and therefore his deſcription may perhaps be equally applicable to many ſuch chalky precipices on the ſea-ſhore.

This method of copying after general ideas formed by the artiſt from obſervation of many individuals, diſtinguiſhes the Italian and all the ſublime painters, from the Dutch and their imitators. Theſe give us bare nature, with the imperfections and peculiarities of individual things or perſons; but thoſe give nature improved as far as probability and the deſign of the piece will admit. Teniers and Hogarth draw faces, and figures, and dreſſes, from real life, and preſent manners; and therefore their pieces muſt in ſome degree loſe the effect, and become awkward, when the preſent faſhions become obſolete.——Raphael and Reynolds take their models from general nature; avoiding, as far

* Poetic. § 9.

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far as poſſible, (at leaſt in all their great performances), thoſe peculiarities that derive their beauty from mere faſhion; and therefore their works muſt give pleaſure, and appear elegant as long as men are capable of forming general ideas, and of judging from them. The laſt-mentioned incomparable artiſt is particularly obſervant of children, whoſe looks and attitudes, being leſs under the controul of art and local manners, are more characteriſtical of the ſpecies than thoſe of men and women. This field of obſervation has ſupplied him with many fine figures, particularly that moſt exquiſite one of Comedy, ſtruggling for and winning (for who could reſiſt her!) the affections of Garrick:—a figure which could never have occurred to the imagination of a painter who had confined his views to grown perſons looking and moving in all the formality of polite life;—a figure which in all ages and countries would be pronounced natural and engaging;—whereas thoſe human forms that we ſee every day bowing and courteſying, and ſtrutting, and turning out their toes *ſecundum artem*, and dreſſed in ruffles, and wigs, and flounces, and hoop-petticoats, and full-trimmed ſuits, would appear elegant no further than the preſent faſhions are propagated, and no longer than they remain unaltered.

22 In order to pleaſe all ages and countries.

23 The period in the progreſs of human ſociety to which epic and tragic poets ſhould attend.

There is, in the progreſs of human ſociety, as well as of human life, a period to which it is of great importance for the higher order of poets to attend, and from which they will do well to take their characters, and manners, and the era of their events; namely, that wherein men are raiſed above ſavage life, and conſiderably improved by arts, government, and converſation; but not advanced ſo high in the aſcent towards politeneſs, as to have acquired a habit of diſguiſing their thoughts and paſſions, and of reducing their behaviour to the uniformity of the mode. Such was the period which Homer had the good fortune (as a poet) to live in, and to celebrate. This is the period at which the manners of men are moſt picturesque, and their adventures moſt romantic. This is the period when the appetites unperverted by luxury, the powers unnervated by effeminacy, and the thoughts diſengaged from artificial reſtraint, will, in perſons of ſimilar diſpoſitions and circumſtances, operate in nearly the ſame way; and when, conſequently, the characters of particular men will approach to the nature of poetical or general ideas, and, if well imitated, give pleaſure to the whole, or at leaſt to a great majority of mankind. But a character tinctured with the faſhions of polite life would not be ſo generally intereſting. Like a human figure adjuſted by a modern dancing-maſter, and dreſſed by a modern tailor, it may have a good effect in ſatire, comedy, or farce: but if introduced into the higher poetry, it would be admired by thoſe only who had learned to admire nothing but preſent faſhions, and by them no longer than the preſent faſhions laſted; and to all the reſt of the world would appear awkward, unaffecting, and perhaps ridiculous. But Achilles and Sarpedon, Diomede and Hector, Neſtor and Ulyſſes, as drawn by Homer, muſt in all ages, independently on faſhion, command the attention and admiration of mankind. Theſe have the qualities that are univerſally known to belong to human nature; whereas the modern fine gentleman is diſtinguiſhed by qualities that belong only to a particular age, ſociety, and manner of the world. We ſpeak not of moral or intellectual virtues, which are objects of admiration to every age; but of thoſe outward accompliſhments, and that particular temperature of the paſſions, which form the moſt perceptible part of a human character.——As, therefore, the politician, in diſcuſſing the rights of mankind, muſt often allude to an imaginary ſtate of nature; ſo the poet who intends to raiſe admiration, pity, terror, and other important emotions, in the generality of mankind, eſpcially in thoſe readers whoſe minds are moſt improved, muſt take his picture of life and manners, rather from the heroic period we now ſpeak of, than from the ages of refinement; and muſt therefore (to repeat the maxim of Ariſtotle) "exhibit things, not as they are, but as they might be."

4

Sect. IV. *Of Poetical Characters.*

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24 Requiſites to the delineation of poetical characters.

Horace ſeems to think, that a competent knowledge of moral philoſophy will fit an author for aſſigning the ſuitable qualities and duties to each poetical perſonage: (*Art. Poet.* v. 309.—316.). The maxim may be true, as far as mere morality is the aim of the poet; but cannot be underſtood to refer to the delineation of poetical characters in general: for a thorough acquaintance with all the moral philoſophy in the world would not have enabled Blackmore to paint ſuch a perſonage as Homer's Achilles, Shakeſpeare's Othello, or the Satan of Paradiſe Loſt. To a competency of moral ſcience, there muſt be added an extenſive knowledge of mankind, a warm and elevated imagination, and the greateſt ſenſibility of heart, before a genius can be formed equal to ſo difficult a taſk. Horace is indeed ſo ſenſible of the danger of introducing a new character in poetry, that he even diſcourages the attempt, and adviſes the poet rather to take his perſons from the ancient authors, or from tradition: *Ibid.* v. 119.—130.

To conceive the idea of a good man, and to invent and ſupport a great poetical character, are two very different things, however they may ſeem to have been confounded by ſome late critics. The firſt is eaſy to any perſon ſufficiently inſtructed in the duties of life: the laſt is perhaps of all the efforts of human genius the moſt difficult; ſo very difficult, that, though attempted by many, Homer, Shakeſpeare, and Milton, are almoſt the only authors who have ſucceeded in it. But characters of perfect virtue are not the moſt proper for poetry. It ſeems to be agreed, that the Deity ſhould not be introduced in the machinery of a poetical fable. To aſcribe to him words and actions of our own invention, ſeems very unbecoming; nor can a poetical deſcription, that is known to be, and muſt of neceſſity be, infinitely inadequate, ever ſatisfy the human mind. Poetry, according to the beſt critics, is an imitation of human action; and therefore poetical characters, though elevated, ſhould ſtill partake of the paſſions and frailties of humanity. If it were not for the vices of ſome principal perſonages, the Iliad would not be either ſo intereſting or ſo moral: the moſt moving and moſt eventful parts of the Æneid are thoſe that deſcribe the effects of unlawful paſſion:—the moſt inſtructive tragedy in the world, we mean Macbeth, is founded in crimes of dreadful enormity:—and if Milton had not taken into his plan the fall of our firſt parents, as well as their ſtate of innocence, his

25 Which, though elevated, ſhould partake of the frailties of humanity;

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his divine poem muſt have wanted much of its pathos, and could not have been (what it now is) ſuch a treaſure of important knowledge, as no other uninſpired writer ever comprehended in ſo ſmall a compaſs.—— Virtue, like truth, is uniform and unchangeable. We may anticipate the part a good man will act in any given circumſtances: and therefore the events that depend on ſuch a man muſt be leſs ſurpriſing than thoſe which proceed from paſſion; the viciſſitudes whereof it is frequently impoſſible to foreſee. From the violent temper of Achilles, in the Iliad, ſpring many great incidents; which could not have taken place, if he had been calm and prudent like Ulyſſes, or pious and patriotic like Eneas: his rejection of Agamemnon's offers, in the ninth book, ariſes from the violence of his reſentment;—his yielding to the requeſt of Patroclus, in the 16th, from the violence of his friendſhip (if we may ſo ſpeak) counteracting his reſentment; and his reſtoring to Priam the dead body of Hector, in the 24th, from the violence of his affection to his own aged father, and his regard to the command of Jupiter, counteracting, in ſome meaſure, both his ſorrow for his friend, and his thirſt for vengeance.——Beſides, except where there is ſome degree of vice, it pains us too exquiſitely to ſee misfortune; and therefore poetry would ceaſe to have a pleaſurable influence over our tender paſſions, if it were to exhibit virtuous characters only. And as in life, evil is neceſſary to our moral probation, and the poſſibility of error to our intellectual improvement; ſo bad or mixed characters are uſeful in poetry, to give to the good ſuch oppoſition, as puts them upon diſplaying and exerciſing their virtue.

26 Whilſt the perſonages in whoſe fate the poet means that we ſhould be intereſted ought to have good and great qualities.

All thoſe perſonages, however, in whoſe fortune the poet means that we ſhould be intereſted, muſt have agreeable and admirable qualities to recommend them to our regard. And perhaps the greateſt difficulty in the art lies in ſuitably blending thoſe faults which the poet finds it expedient to give to any particular hero, with ſuch moral, intellectual, or corporeal accompliſhments, as may engage our eſteem, pity, or admiration, without weakening our hatred of vice, or love of virtue. In moſt of our novels, and in many of our plays, it happens unluckily, that the hero of the piece is ſo captivating, as to incline us to be indulgent to every part of his character, the bad as well as the good. But a great maſter knows how to give the proper direction to human ſenſibility; and, without any perverſion of our faculties, or any confuſion of right and wrong, to make the ſame perſon the object of very different emotions, of pity and hatred, of admiration and horror. Who does not eſteem and admire Macbeth for his courage and generoſity? who does not pity him when beſet with all the terrors of a pregnant imagination, ſuperſtitious temper, and awakened conſcience? who does not abhor him as a monſter of cruelty, treachery, and ingratitude? His good qualities, by drawing us near to him, make us, as it were, eye-witneſſes of his crime, and give us a fellow-feeling of his remorſe; and therefore, his example cannot fail to have a powerful effect in cheriſhing our love of virtue, and fortifying our minds againſt criminal impreſſions; whereas, had he wanted thoſe good qualities, we ſhould have kept aloof from his concerns, or viewed them with a ſuperficial attention; in which caſe his example would have had little more weight than that of the robber, of whom we know nothing, but that he was tried, condemned, and executed.—Satan, in Paradiſe Loſt, is a character drawn and ſupported with the moſt conſummate judgment. The old furies and demons, Hecate, Tiſiphone, Alecto, Megara, are objects of unmixed and unmitigated abhorrence; Tityus, Enceladus, and their brethren, are remarkable for nothing but impiety, deformity, and vaſtneſs of ſize; Pluto is, at beſt, an inſipid perſonage; Mars, a hair-brained ruffian; Taſſo's infernal tyrant, an ugly and overgrown monſter:—but in the Miltonic Satan, we are forced to admire the majeſty of the ruined archangel, at the ſame time that we deteſt the unconquerable depravity of the fiend. "But, of all poetical characters, (ſays the elegant critic from whom we are extracting), the Achilles of Homer (D) ſeems to me the moſt exquiſite of invention, and the moſt highly finiſhed. The utility of this character in a moral view is obvious; for it may be conſidered as the ſource of all the morality of the Iliad. Had not the generous and violent temper of Achilles determined him to patronize the augur Calchas in defiance of Agamemnon, and afterwards on being affronted by that vindictive commander, to abandon for a time the common cauſe of Greece;—the fatal effects of diſſenſion among confederates, and of capricious and tyrannical behaviour in a ſovereign, would not have been the leading moral of Homer's poetry; nor could Hector, Sarpedon, Eneas, Ulyſſes, and the other amiable heroes, have been brought forward to ſignalize their virtues, and to recommend themſelves to the eſteem and imitation of mankind.

Beattie's Eſſays.

27 The excellence of the poetical character of Achilles, and

"They who form their judgment of Achilles from the imperfect ſketch given of him by Horace in the *Art of Poetry*, (v. 121, 122.); and conſider him only as a hateful compoſition of anger, revenge, fierceneſs, obſtinacy and pride, can never enter into the views of Homer, nor be ſuitably affected with his narration. All theſe vices are no doubt, in ſome degree, combined in Achilles; but they are tempered with qualities of a different ſort, which render him a moſt intereſting character, and of courſe make the Iliad a moſt intereſting poem. Every reader abhors the faults of this hero: and yet, to an attentive reader of Homer, this hero muſt be the object of eſteem, admiration, and pity; for he has many good as well as bad affections, and is equally violent

(D) "I ſay the *Achilles of HOMER*. Later authors have degraded the character of this hero, by ſuppoſing every part of his body invulnerable except the heel. I know not how often I have heard this urged as one of Homer's abſurdities; and indeed the whole Iliad is one continued abſurdity, on this ſuppoſition. But Homer all along makes his hero equally liable to wounds and death with other men. Nay, to prevent all miſtakes in regard to this matter, (if thoſe who cavil at the poet would but read his work), he actually wounds him in the right arm by the lance of Aſteropæus, in the battle near the river Scamander." See *Iliad*, xxi. verſe 161—168.

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violent in all:—Nor is he possessed of a single vice or virtue, which the wonderful art of the poet has not made subservient to the design of the poem, and to the progress and catastrophe of the action; so that the hero of the Iliad, considered as a poetical personage, is just what he should be, neither greater nor less, neither worse nor better.—He is everywhere distinguished by an abhorrence of oppression, by a liberal and elevated mind, by a passion for glory, and by a love of truth, freedom, and sincerity. He is for the most part attentive to the duties of religion; and, except to those who have injured him, courteous and kind: he is affectionate to his tutor Phenix; and not only pities the misfortunes of his enemy Priam, but in the most soothing manner administers to him the best consolation that Homer's poor theology could furnish. Though no admirer of the cause in which his evil destiny compels him to engage, he is warmly attached to his native land; and, ardent as he is in vengeance, he is equally so in love to his aged father Peleus, and to his friend Patroclus. He is not luxurious like Paris, or clownish like Ajax; his accomplishments are princely, and his amusements worthy of a hero. Add to this, as an apology for the vehemence of his anger, that the affront he had received was (according to the manners of that age) of the most atrocious nature; and not only unprovoked, but such as, on the part of Agamemnon, betrayed a brutal insensibility to merit, as well as a proud, selfish, ungrateful, and tyrannical disposition. And though he is often inexcusably furious; yet it is but justice to remark, that he was not naturally cruel (E); and that his wildest outrages were such as in those rude times might be expected from a violent man of invincible strength and valour, when exasperated by injury, and frantic with sorrow. Our hero's claim to the admiration of mankind is indisputable. Every part of his character is sublime and astonishing. In his person, he is the strongest, the swiftest, the most beautiful of men:—this last circumstance, however, occurs not to his own observation, being too trivial to attract the notice of so great a mind. The Fates had put it in his power, either to return home before the end of the war, or to remain at Troy:—if he chose the former, he would enjoy tranquillity and happiness in his own country to a good old age; if the latter, he must perish in the bloom of his youth:—his affection to his father and native country, and his hatred to Agamemnon, strongly urged him to the first; but a desire to avenge the death of his friend determines him to accept the last with all its consequences. This at once displays the greatness of his fortitude, the warmth of his friendship, and the violence of his sanguinary passions: and it is this that so often and so powerfully recommends him to the pity, as well as admiration, of the attentive reader."

28 Of all Homer's characters.

It is equally a proof of rich invention and exact judgment in Homer, that he mixes some good qualities in all his bad characters, and some degree of imperfection in almost all his good ones.—Agamemnon, notwithstanding his pride, is an able general, and a valiant man, and highly esteemed as such by the greater part of the army.—Paris, though effeminate, and vain of his dress and person, is, however, good-natured, patient of reproof, not destitute of courage, and eminently skilled in music and other fine arts.—Ajax is a huge giant; fearless rather from insensibility to danger, and confidence in his massy arms, than from any nobler principle; boastful and rough; regardless of the gods, though not downright impious: yet there is in his manner something of frankness and blunt sincerity, which entitle him to a share in our esteem; and he is ever ready to assist his countrymen, to whom he renders good service on many a perilous emergency.——The character of Helen, in spite of her faults, and of the many calamities whereof she is the guilty cause, Homer has found means to recommend to our pity, and almost to our love; and this he does, without seeking to extenuate the crime of Paris, of which the most respectable personages in the poem are made to speak with becoming abhorrence. She is so full of remorse, so ready on every occasion to condemn her past conduct, so affectionate to her friends, so willing to do justice to every body's merit, and withal so finely accomplished, that she extorts our admiration, as well as that of the Trojan senators.——Menelaus, though sufficiently sensible of the injury he had received, is yet a man of moderation, clemency, and good-nature, a valiant soldier, and a most affectionate brother: but there is a dash of vanity in his composition, and he entertains rather too high an opinion of his own abilities, yet never overlooks nor undervalues the merit of others.—Priam would claim unreserved esteem, as well as pity, if it were not for his inexcuseable weakness, in gratifying the humour, and by indulgence abetting the crimes, of the most worthless of all his children, to the utter ruin of his people, family, and kingdom. Madame Dacier supposes, that he had lost his authority, and was obliged to fall in with the politics of the times: but of this there appears no evidence; on the contrary, he and his unworthy favourite Paris seem to have been the only persons of distinction in Troy who were averse to the restoring of Helen. Priam's foible (if it can be called by so soft a name), however faulty, is not uncommon, and has often produced calamity both in private and public life. The Scripture gives a memorable instance in the history of the good old Eli.——Sarpedon comes nearer a perfect character than any other of Homer's heroes; but the part he has to act is short. It is a character which one could hardly have expected in those rude times: a sovereign prince, who considers himself as a magistrate set up by the people for the public good, and therefore bound in honour and gratitude to be himself their example, and study to excel as much in virtue as in rank and authority.——Hector is the favourite of every reader, and with good reason. To the truest valour he joins the most generous patriotism. He abominates the crime of Paris: but not being able to prevent the war, he thinks it his duty to defend his country, and his father and sovereign, to the last. He too, as well as Achilles, foresees his

Beattie, ut supra.

(E) See *Iliad* xxi. 100. and xxiv. 485—673.—In the first of these passages, Achilles himself declares, that before Patroclus was slain, he often spared the lives of his enemies, and took pleasure in doing it. It is strange, as Dr Beattie observes, that this should be left out in Pope's Translation.

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his own death; which heightens our compaſſion, and raiſes our idea of his magnanimity. In all the relations of private life, as a ſon, a father, a huſband, a brother, he is amiable in the higheſt degree; and he is diſtinguiſhed among all the heroes for tenderneſs of affection, gentleneſs of manners, and a pious regard to the duties of religion. One circumſtance of his character, ſtrongly expreſſive of a great and delicate mind, we learn from Helen's lamentation over his dead body, that he was almoſt the only perſon in Troy who had always treated her with kindneſs, and never uttered one reproachful word to give her pain, nor heard others reproach her without blaming them for it. Some tendency to oſtentation (which however may be pardonable in a commander in chief), and temporary fits of timidity, are the only blemiſhes diſcoverable in this hero; whoſe portrait Homer appears to have drawn with an affectionate and peculiar attention.

By aſcribing ſo many amiable qualities to Hector and ſome others of the Trojans, the poet intereſts us in the fate of that people, notwithſtanding our being continually kept in mind that they are the injurious party. And by thus blending good and evil, virtue and frailty, in the compoſition of his characters, he makes them the more conformable to the real appearances of human nature, and more uſeful as examples for our improvement; and at the ſame time, without hurting veriſimilitude, gives every neceſſary embelliſhment to particular parts of his poem, and variety, coherence, and animation, to the whole fable. And it may alſo be obſerved, that though ſeveral of his characters are complex, not one of them is made up of incompatible parts: all are natural and probable, and ſuch as we think we have met with, or might have met with, in our intercourſe with mankind.

From the ſame extenſive views of good and evil in all their forms and combinations, Homer has been enabled to make each of his characters perfectly diſtinct in itſelf, and different from all the reſt; inſomuch that before we come to the end of the Iliad, we are as well acquainted with his heroes, as with the faces and tempers

29 Virgil fails in drawing characters.

of our moſt familiar friends. Virgil, by confining himſelf to a few general ideas of fidelity and fortitude, has made his ſubordinate heroes a very good ſort of people; but they are all the ſame, and we have no clear knowledge of any one of them. Achates is faithful, and Gyas is brave, and Cloanthus is brave; and this is all we can ſay of the matter. We ſee theſe heroes at a diſtance, and have ſome notion of their ſhape and ſize; but are not near enough to diſtinguiſh their features; and every face ſeems to exhibit the ſame faint and ambiguous appearance. But of Homer's heroes we know every particular that can be known. We eat, and drink, and talk, and fight, with them: we ſee them in action and out of it; in the field and in their tents and houſes: the very face of the country about Troy we ſeem to be as well acquainted with as if we had been there. Similar characters there are among theſe heroes, as there are ſimilar faces in every ſociety; but we never miſtake one for another. Neſtor and Ulyſſes are both wiſe and both eloquent: but the wiſdom of the former ſeems to be the effect of experience; that of the latter of genius: the eloquence of the one is ſweet and copious, but not always to the purpoſe, and apt to degenerate into ſtory-telling; that of the other is cloſe, emphatical, and perſuaſive, and accompanied with a peculiar modeſty and ſimplicity of manner. Homer's heroes are all valiant; yet each diſplays a modification of valour peculiar to himſelf; one is valiant from principle, another from conſtitution; one is raſh, another cautious; one is impetuous and headſtrong, another impetuous, but tractable; one is cruel, another merciful; one is inſolent and oſtentatious, another gentle and unaſſuming; one is vain of his perſon, another of his ſtrength, and a third of his family.—It would be tedious to give a complete enumeration. Almoſt every ſpecies of the heroic character is to be found in Homer.

Of the agents in Paradiſe Loſt, it has been obſerved*, that "the weakeſt are the higheſt and nobleſt of human beings, the original parents of mankind; with whoſe actions the elements conſented; on whoſe rectitude or deviation of will depended the ſtate of terreſtrial nature, and the condition of all the future inhabitants of the globe. Of the other agents in the poem, the chief are ſuch as it is irreverence to name on ſlight occaſions: the reſt are lower powers;

> ——Of which the leaſt could wield
> Theſe elements, and arm him with the force
> Of all their regions:

30 The difficulty of drawing and diſcriminating the characters in Paradiſe Loſt.

Powers, which only the controul of Omnipotence reſtrains from laying creation waſte, and filling the vaſt expanſe of ſpace with ruin and confuſion. To diſplay the motives and actions of beings thus ſuperior, ſo far as human reaſon can examine, or human imagination repreſent them, is the taſk which Milton undertook and performed. The characters in the Paradiſe Loſt, which admit of examination, are thoſe of angels and of men: of angels good and evil; of man in his innocent and ſinful ſtate.

"Among the angels, the virtue of Raphael is mild and placid, of eaſy condeſcenſion, and free communication: that of Michael is regal and lofty, attentive to the dignity of his own nature. Abdiel and Gabriel appear occaſionally, and act as every incident requires: the ſolitary fidelity of Abdiel is very amiably painted.

"Of the evil angels, the characters are more diverſified. To Satan ſuch ſentiments are given as ſuit the moſt exalted and moſt depraved being. Milton has been cenſured for the impiety which ſometimes breaks from Satan's mouth; for there are thoughts, it is juſtly remarked, which no obſervation of character can juſtify; becauſe no good man would willingly permit them to paſs, however tranſiently, through his mind. This cenſure has been ſhown to be groundleſs by the great critic from whom we quote. To make Satan ſpeak as a rebel, ſays he, without any ſuch expreſſions as might taint the reader's imagination, was indeed one of the great difficulties in Milton's undertaking; and I cannot but think that he has extricated himſelf with great happineſs.

31 Milton's ſucceſs in this part of his undertaking.

There is in Satan's ſpeeches little that can give pain to a pious ear. The language of rebellion cannot be the ſame with that of obedience: the malignity of Satan foams in haughtineſs and obſtinacy; but his expreſſions are commonly general, and no otherwiſe offenſive than as they are wicked.—The other chiefs of the celeſtial rebellion are very judiciouſly diſcriminated; and the ferocious character of Moloch appears, both in the battle and in the council, with exact conſiſtency.

"To

* *Johnſon's Life of Milton.*

"To Adam and to Eve are given, during their innocence, ſuch ſentiments as innocence can generate and utter. Their love is pure benevolence and mutual veneration; their repaſts are without luxury, and their diligence without toil. Their addreſſes to their Maker have little more than the voice of admiration and gratitude: fruition left them nothing to aſk, and innocence left them nothing to fear. But with guilt enter diſtruſt and diſcord, mutual accuſation and ſtubborn ſelf-defence: they regard each other with alienated minds, and dread their Creator as the avenger of their tranſgreſſion; at laſt, they ſeek ſhelter in his mercy, ſoften to repentance, and melt in ſupplication. Both before and after the fall, the different ſentiments ariſing from difference of ſex are traced out with inimitable delicacy and philoſophical propriety. Adam has always that preeminence in dignity, and Eve in lovelineſs, which we ſhould naturally look for in the father and mother of mankind."

From what has been ſaid, it ſeems abundantly evident,—That the end of poetry is to pleaſe; and therefore that the moſt perfect poetry muſt be the moſt pleaſing;—that what is unnatural cannot give pleaſure; and therefore that poetry muſt be according to nature:—that it muſt be either according to real nature, or according to nature ſomewhat different from the reality;

32
Poetry according to nature improved to that degree which is conſiſtent with probability.

—that, if according to real nature, it would give no greater pleaſure than hiſtory, which is a tranſcript of real nature;—that greater pleaſure is, however, to be expected from it, becauſe we grant it ſuperior indulgence, in regard to fiction, and the choice of words;—and, conſequently, that poetry muſt be, not according to real nature, but according to nature improved to that degree which is conſiſtent with probability and ſuitable to the poet's purpoſe.——And hence it is that we call poetry, *An imitation of nature.*—For that which is properly termed *imitation* has always in it ſomething which is not in the original. If the prototype and tranſcript be exactly alike; if there be nothing in the one which is not in the other; we may call the latter a *repreſentation*, a *copy*, a *draught*, or a *picture*, of the former; but we never call it an *imitation*.

Sect. V. *Of Arrangement, Unity, Digreſſion.—Further remarks on Nature in Poetry.*

I. The origin of nations, and the beginnings of great events, are little known, and ſeldom intereſting; whence the firſt part of every hiſtory, compared with the ſequel, is ſomewhat dry and tedious. But a poet muſt, even in the beginning of his work, intereſt the readers, and raiſe high expectation; not by an affected pomp of ſtyle, far leſs by ample promiſes or bold profeſſions; but by ſetting immediately before them ſome incident, ſtriking enough to raiſe curioſity, in regard both to its cauſes and to its conſequences. He muſt therefore take up his ſtory, not at the beginning, but in the middle; or rather, to prevent the work from being too long, as near the end as poſſible; and afterwards take ſome proper opportunity to inform us of the preceding events, in the way of narrative, or by converſation of the perſons introduced, or by ſhort and natural digreſſions.

33
How a poem ought to begin.

The action of both the *Iliad* and *Odyſſey* begins about ſix weeks before its concluſion; although the principal events of the war of Troy are to be found in the former; and the adventures of a ten years voyage, followed by the ſuppreſſion of a dangerous domeſtic enemy, in the latter. One of the firſt things mentioned by Homer in the Iliad, is a plague, which Apollo in anger ſent into the Grecian army commanded by Agamemnon and now encamped before Troy. Who this Agamemnon was, and who the Grecians were; for what reaſon they had come hither; how long the ſiege had laſted; what memorable actions had been already performed; and in what condition both parties now were:—all this, and much more, we ſoon learn from occaſional hints and converſations interſperſed through the poem.

In the *Æneid*, which, though it comprehends the tranſactions of ſeven years, opens within a few months of the concluding event, we are firſt preſented with a view of the Trojan fleet at ſea, and no leſs a perſon than Juno intereſting herſelf to raiſe a ſtorm for their deſtruction. This excites a curioſity to know ſomething further: who theſe Trojans were, whence they had come, and whither they were bound; why they had left their own country, and what had befallen them ſince they left it. On all theſe points, the poet, without quitting the track of his narrative, ſoon gives the fulleſt information: The ſtorm riſes; the Trojans are driven to Africa, and hoſpitably received by the queen of the country; at whoſe deſire their commander relates his adventures.

The action of *Paradiſe Loſt* commences not many days before Adam and Eve are expelled from the garden of Eden, which is the concluding event. This poem, as its plan is incomparably more ſublime and more important than that of either the Iliad or Æneid, opens with a far more intereſting ſcene: a multitude of angels and archangels ſhut up in a region of torment and darkneſs, and rolling on a lake of unquenchable fire. Who theſe angels are, and what brought them into this miſerable condition, we naturally wiſh to know; and the poet in due time informs us; partly from the converſation of the fiends themſelves; and more particularly by the mouth of a happy ſpirit, ſent from heaven to caution the father and mother of mankind againſt temptation, and confirm their good reſolutions by unfolding the dreadful effects of impiety and diſobedience.

This poetical arrangement of events, ſo different from the hiſtorical, has other advantages beſides thoſe ariſing from brevity and compactneſs of detail: it is obviouſly more affecting to the fancy, and more alarming to the paſſions; and, being more ſuitable to the order and the manner in which the actions of other men ſtrike our ſenſes, is a more exact imitation of human affairs. I hear a ſudden noiſe in the ſtreet, and run to ſee what is the matter. An inſurrection has happened, a great multitude is brought together, and ſomething very important is going forward. The ſcene before me is the firſt thing that engages my attention; and is in itſelf ſo intereſting, that for a moment or two I look at it in ſilence and wonder. By and by, when I get time for reflection, I begin to inquire into the cauſe of all this tumult, and what it is the people would be at; and one who is better informed than I, explains the affair from the beginning; or perhaps I make this out for myſelf, from the words and actions of the perſons principally concerned. This is a ſort of picture of poetical arrangement, both in epic and dramatic compoſition; and this plan

Beattie, ut ſupra.

34
The advantage of the poetical arrangement.

plan has been followed in narrative odes and ballads both ancient and modern.—The historian pursues a different method. He begins perhaps with an account of the manners of a certain age, and of the political constitution of a certain country; then introduces a particular person, gives the story of his birth, connections, private character, pursuits, disappointments, and of the events that promoted his views, and brought him acquainted with other turbulent spirits like himself; and so proceeds, unfolding, according to the order of time, the causes, principles, and progress of the conspiracy, if that be the subject which he undertakes to illustrate. It cannot be denied, that this latter method is more favourable to calm information: but the former, compared with it, will be found to have all the advantages already specified, and to be more effectually productive of that mental pleasure which depends on the passions and imagination.

35
Unity of design necessary to the higher poetry.

II. If a work have no determinate end, it has no meaning; and if it have many ends, it will distract by its multiplicity. Unity of design, therefore, belongs in some measure to all compositions, whether in verse or prose. But to some it is more essential than to others; and to none so much as in the higher poetry. In certain kinds of history, there is unity sufficient if all the events recorded be referred to one person; in others, if to one period of time, or to one people, or even to the inhabitants of one and the same planet. But it is not enough that the subject of a poetical fable be the exploits of one person; for these may be of various and even of opposite sorts and tendencies, and take up longer time than the nature of poetry can admit:—far less can a regular poem comprehend the affairs of one period or of one people:—it must be limited to one great action or event, to the illustration of which all the subordinate events must contribute; and these must be so connected with one another, as well as with the poet's general purpose, that one cannot be changed, transposed, or taken away, without affecting the consistence and stability of the whole *. In itself an incident may be interesting; a character well drawn, a description beautiful; and yet, if it disguise the general plan, or if it obstruct or encumber the main action, instead of helping it forward, a correct artist would consider it but as a gaudy superfluity or splendid deformity; like a piece of scarlet cloth sewed upon a garment of a different colour †. Not that all the parts of the fable either are, or can be, equally essential. Many descriptions and thoughts, of little consequence to the plan, may be admitted for the sake of variety: and the poet may, as well as the historian and philosopher, drop his subject for a time, in order to take up an affecting or instructive digression.

36
The propriety of digressions and episodes depends upon

III. The doctrine of poetical digressions and episodes has been largely treated by the critics. We shall here only remark, that, in estimating their propriety, three things are to be attended to:—their connection with the fable or subject; their own peculiar excellence; and their subserviency to the poet's design.

37
their connection with the subject of the poem.

(1.) Those digressions that both arise from and terminate in the subject, like the episode of the angel Raphael in Paradise Lost, and the transition to the death of Caesar and the civil wars in the first book of the Georgic, are the most artful, and if suitably executed, claim the highest praise:—those that arise from, but do not terminate in, the subject, are perhaps second in the order of merit; like the story of Dido in the Æneid, and the encomium on a country life in the second book of the Georgic: those come next that terminate in, but do not rise from, the fable; of which there are several in the third book of the Æneid and in the Odyssey:—and those that neither terminate in the fable nor rise from it are the least artful; and if they be long, cannot escape censure, unless their beauty be very great.

38
Their own peculiar excellence, and

But (2.) we are willing to excuse a beautiful episode at whatever expence to the subject it may be introduced. They who can blame Virgil for obtruding upon them the charming tale of Orpheus and Euridice in the fourth Georgic, or Milton for the apostrophe to light in the beginning of his third book, ought to forfeit all title to the perusal of good poetry; for of such divine strains one would rather be the author than of all the books of criticism in the world. Yet still it is better that an episode possess the beauty of connection, together with its own intrinsic elegance, than this without the other.

39
their subserviency to the poet's design.

Moreover, in judging of the propriety of episodes and other similar contrivances, it may be expedient to attend (3.) to the design of the poet, as distinguished from the fable or subject of the poem. The great design, for example, of Virgil, was to interest his countrymen in a poem written with a view to reconcile them to the person and government of Augustus. Whatever, therefore, in the poem tends to promote this design, even though it should in some degree hurt the contexture of the fable, is really a proof of the poet's judgment; and may be not only allowed, but applauded.—The progress of the action of the Æneid may seem to be too long obstructed in one place by the story of Dido, which, though it rises from the preceding part of the poem, has no influence upon the sequel: and, in another, by the episode of Cacus, which, without injury to the fable, might have been omitted altogether. Yet these episodes, interesting as they are to us and all mankind because of the transcendant merit of the poetry, must have been still more interesting to the Romans because of their connection with the Roman affairs; for the one accounts poetically for their wars with Carthage; and the other not only explains some of their religious ceremonies, but also gives a most charming rural picture of those hills and valleys in the neighbourhood of the Tiber, on which, in after times, their majestic city was fated to stand.—And if we consider, that the design of Homer's Iliad was not only to show the fatal effects of dissension among confederates, but also to immortalize his country, and celebrate the most distinguished families in it, we shall be inclined to think more favourably than critics generally do of some of his long speeches and digressions; which, though to us they may seem trivial, must have been very interesting to his countrymen on account of the genealogies and private history recorded in them.—Shakespeare's historical plays, considered as dramatic fables, and tried by the laws of tragedy and comedy, appear very rude compositions; but if we attend to the poet's design (as the elegant critic ‡ has with equal truth and beauty explained it), we shall be forced to admire his judgment in the general conduct of those pieces, as well as unequalled success in the execution of particular parts.

There is yet another point of view in which these digressions may be considered. If they tend to elucidate any important character, or to introduce any interesting event not otherwise within the compass of the poem, or

to

* *Arist. Poet.* § 8.

† *Hor. Ar. Poet.* v. 15. &c.

‡ *Essays on the writings and genius of Shakespeare*, p. 55.

Of Poetical Arrangement, &c.

to give an amiable diſplay of any particular virtue, they may be intitled, not to our pardon only, but even to our admiration, however looſely they may hang upon the fable. All theſe three ends are effected by that moſt beautiful epiſode of Hector and Andromache in the ſixth book of the Iliad; and the two laſt, by the no leſs beautiful one of Euryalus and Niſus in the ninth book of the Æneid.

IV. And now, from the poſition formerly eſtabliſhed, that the end of this divine art is to give pleaſure, it has been endeavoured to prove, that, whether in diſplaying the appearances of the material univerſe, or in imitating the workings of the human mind, and the varieties of human character, or in arranging and combining into one whole the ſeveral incidents and parts whereof his fable conſiſts,—the aim of the poet muſt be to copy nature, not as it is, but in that ſtate of perfection in which, conſiſtently with the particular genius of the work, and the laws of veriſimilitude, it may be ſuppoſed to be.

Such, in general, is the nature of that poetry which is intended to raiſe admiration, pity, and other ſerious emotions. But in this art, as in all others, there are different degrees of excellence; and we have hitherto directed our view chiefly to the higheſt. All ſerious poets are not equally ſolicitous to improve nature. Euripides is ſaid to have repreſented men as they were; Sophocles, more poetically, as they ſhould or might be *. Theocritus in his Idyls, and Spenſer in his Shepherd's Calendar, give us language and ſentiments more nearly approaching thoſe of the *Rus verum et barbarum* †, than what we meet with in the Paſtorals of Virgil and Pope. In the hiſtorical drama, human characters and events muſt be according to hiſtorical truth, or at leaſt not ſo remote from it as to lead into any important miſapprehenſion of fact. And in the hiſtorical epic poem, ſuch as the Pharſalia of Lucan, and the Campaign of Addiſon, the hiſtorical arrangement is preferred to the poetical, as being nearer the truth. Yet nature is a little improved even in theſe poems. The perſons in Shakeſpeare's hiſtorical plays, and the heroes of the Pharſalia, talk in verſe, and ſuitably to their characters, and with a readineſs, beauty, and harmony of expreſſion, not to be met with in real life, nor even in hiſtory: ſpeeches are invented, and, to heighten the deſcription, circumſtances added, with great latitude: real events are rendered more compact and more ſtrictly dependent upon one another; and fictitious ones brought in, to elucidate human characters and diverſify the narration.

* *Ariſt. Poet.*

† *Martial.*

40 Nature always to be improved by the poet, though

The more poetry improves nature, by copying after general ideas collected from extenſive obſervation, the more it partakes (according to Ariſtotle) of the nature of philoſophy; the greater ſtretch of fancy and of obſervation it requires in the artiſt, the better chance it has to be univerſally agreeable.

41 when poetry falls ſhort of this perfection it may have great merit in other reſpects.

Yet poetry, when it falls ſhort of this perfection, may have great merit as an inſtrument of both inſtruction and pleaſure. To moſt men, ſimple unadorned nature is, at certain times, and in certain compoſitions, more agreeable than the moſt elaborate improvements of art; as a plain ſhort period, without modulation, gives a pleaſing variety to a diſcourſe. Many ſuch portraits of ſimple nature there are in the ſubordinate parts both of Homer's and of Virgil's poetry: and an excellent effect they have in giving probability to the fiction, as well as in gratifying the reader's fancy with images diſtinct and lively, and eaſily comprehended. The hiſtorical plays of Shakeſpeare raiſe not our pity and terror to ſuch a height as Lear, Macbeth, or Othello; but they intereſt and inſtruct us greatly notwithſtanding. The rudeſt of the eclogues of Theocritus, or even of Spenſer, have by ſome authors been extolled above thoſe of Virgil, becauſe more like real life. Nay, Corneille is known to have preferred the Pharſalia to the Æneid, perhaps from its being nearer the truth, or perhaps from the ſublime ſentiments of ſtoical morality ſo forcibly and ſo oſtentatiouſly diſplayed in it.

Of Poetical Language.

Poets may refine upon nature too much as well as too little; for affectation and ruſticity are equally remote from true elegance. The ſtyle and ſentiments of comedy ſhould no doubt be more correct and more pointed than thoſe of the moſt polite converſation: but to make every footman a wit, and every gentleman and lady an epigrammatiſt, as Congreve has done, is an exceſſive and faulty refinement. The proper medium has been hit by Menander and Terence, by Shakeſpeare in his happier ſcenes, and by Garrick, Cumberland, and ſome others of late renown. To deſcribe the paſſion of love with as little delicacy as ſome men ſpeak of it would be unpardonable; but to transform it into mere Platonic adoration is to run into another extreme, leſs criminal indeed, but too remote from univerſal truth to be univerſally intereſting. To the former extreme Ovid inclines, and Petrarch and his imitators to the latter. Virgil has happily avoided both: but Milton has painted this paſſion as diſtinct from all others, with ſuch peculiar truth and beauty, that we cannot think Voltaire's encomium too high, when he ſays, that love in all other poetry ſeems a weakneſs, but in Paradiſe Loſt a virtue. There are many good ſtrokes of nature in Ramſay's Gentle Shepherd; but the author's paſſion for the *rus verum* betrays him into ſome indelicacies: a cenſure that falls with greater weight upon Theocritus, who is often abſolutely indecent. The Italian paſtoral of Taſſo and Guarini, and the French of Fontenelle, run into the oppoſite extreme (though in ſome parts beautifully ſimple), and diſplay a ſyſtem of rural manners ſo quaint and affected as to outrage all probability. In fine, though mediocrity of execution in poetry be allowed to deſerve the doom pronounced upon it by Horace; yet it is true, notwithſtanding, that in this art, as in many other good things, the point of excellence lies in a middle between two extremes; and has been reached by thoſe only who ſought to improve nature as far as the genius of their work would permit, keeping at an equal diſtance from ruſticity on the one hand, and affected elegance on the other.

SECT. VI. *Of Poetical Language.*

WORDS in poetry are choſen, firſt, for their *ſenſe*; and, ſecondly, for their *ſound*. That the firſt of theſe grounds of choice is the more excellent nobody can deny. He who in literary matters prefers ſound to ſenſe is a fool. Yet ſound is to be attended to even in proſe, and in verſe demands particular attention. We ſhall conſider poetical language, firſt, as SIGNIFICANT; and, ſecondly, as SUSCEPTIBLE OF HARMONY. 42 Words in poetry to be choſen for their ſenſe and for their ſound.

§ 1.

Of Poetical Language.

§ 1. *Of Poetical Language conſidered as SIGNIFICANT.*

43 The language of poetry an imitation of the language of nature.

If, as it has been endeavoured to prove, poetry be imitative of nature, poetical fictions of real events, poetical images of real appearances in the viſible creation, and poetical perſonages of real human characters; it would ſeem to follow, that the *language of poetry* muſt be an imitation of the *language of nature.*

According to Dr Beattie *, that language is natural which is ſuited to the ſpeaker's condition, character, and circumſtances. And as, for the moſt part, the images and ſentiments of ſerious poetry are copied from the images and ſentiments, not of real, but of improved, nature; ſo the language of ſerious poetry muſt (as hinted already) be a tranſcript, not of the real language of nature, which is often diſſonant and rude, but of natural language improved as far as may be conſiſtent with probability, and with the ſuppoſed character of the ſpeaker. If this be not the caſe, if the language of poetry be ſuch only as we hear in converſation or read in hiſtory, it will, inſtead of delight, bring diſappointment: becauſe it will fall ſhort of what we expect from an art which is recommended rather by its pleaſurable qualities than by its intrinſic utility; and to which, in order to render it pleaſing, we grant higher privileges than to any other kind of literary compoſition, or any other mode of human language.

* Eſſays, Part ii. chap. 1.

44 improved as far as may be conſiſtent with probability, &c.

The next inquiry muſt therefore be, "What are thoſe improvements that peculiarly belong to the language of poetry?" And theſe may be comprehended under two heads; *poetical words*, and *tropes and figures.*

Art. I. Of Poetical Words.

One mode of improvement peculiar to poetical diction reſults from the uſe of thoſe words and phraſes which, becauſe they rarely occur in proſe, and frequently in verſe, are by the grammarian and lexicographer termed *poetical.* In theſe ſome languages abound more than others; but no language perhaps is altogether without them, and perhaps no language can be ſo in which any number of good poems have been written: for poetry is better remembered than proſe, eſpecially by poetical authors, who will always be apt to imitate the phraſeology of thoſe they have been accuſtomed to read and admire; and thus, in the works of poets down through ſucceſſive generations, certain phraſes may have been conveyed, which, though originally perhaps in common uſe, are now confined to poetical compoſition. Proſe writers are not ſo apt to imitate one another, at leaſt in words and phraſes, both becauſe they do not ſo well remember one another's phraſeology, and alſo becauſe their language is leſs artificial, and muſt not, if they would make it eaſy and flowing (without which it cannot be elegant), depart eſſentially from the ſtyle of correct converſation. Poets, too, on account of the greater difficulty of their numbers, have, both in the choice and in the arrangement of words, a better claim to indulgence, and ſtand more in need of a diſcretionary power.

45 All languages have words peculiar to poetry.

The language of Homer differs materially from what was written and ſpoken in Greece in the days of Socrates. It differs in the mode of inflection, it differs in the ſyntax, it differs even in the words: ſo that one might read Homer with eaſe who could not read Xenophon; or Xenophon, without being able to read Homer. Yet we cannot believe that Homer, or the firſt Greek poet who wrote in his ſtyle, would make choice of a dialect quite different from what was intelligible in his own time: for poets have in all ages written with a view to be read, and to be read with pleaſure; which they could not be if their diction were hard to be underſtood. It is more reaſonable to ſuppoſe that the language of Homer is according to ſome ancient dialect, which, though not perhaps in familiar uſe among the Greeks at the time he wrote, was however intelligible. From the Homeric to the Socratic age, a period had elapſed of no leſs than 400 years; during which the ſtyle both of diſcourſe and of writing muſt have undergone great alterations. Yet the Iliad continued the ſtandard of heroic poetry, and was conſidered as the very perfection of poetical language; notwithſtanding that ſome words in it were become ſo antiquated, or ſo ambiguous, that Ariſtotle himſelf ſeems to have been ſomewhat doubtful in regard to their meaning †. And if Chaucer's merit as a poet had been as great as Homer's, and the Engliſh tongue under Edward III. as perfect as the Greek was in the ſecond century after the Trojan war, the ſtyle of Chaucer would probably have been our model for poetical diction at this day; even as Petrarch, his contemporary, is ſtill imitated by the beſt poets of Italy.

Of Poetical Words.

† Poetic. cap. 25.

The rudeneſs of the ſtyle of Ennius has been imputed by the old critics to his having copied too cloſely the dialect of common life. But this appears to be a miſtake. For if we compare the fragments of that author with the comedies of Plautus, who flouriſhed in the ſame age, and whoſe language was certainly copied from that of common life, we ſhall be ſtruck with an air of antiquity in the former that is not in the latter. Ennius, no doubt, like moſt other ſublime poets, affected ſomething of the antique in his expreſſion; and many of his words and phraſes, not adopted by any proſe writer now extant, are to be found in Lucretius and Virgil, and were by them tranſmitted to ſucceeding poets. Theſe form part of the Roman poetical dialect; which appears from the writings of Virgil, where we have it in perfection, to have been very copious. The ſtyle of this charming poet is indeed ſo different from proſe, and is altogether ſo peculiar, that it is perhaps impoſſible to analyſe it on the common principles of Latin grammar. And yet no author can be more perſpicuous or more expreſſive; notwithſtanding the frequency of Greciſm in his ſyntax, and his love of old words, which he, in the judgment of Quintilian, knew better than any other man how to improve into decoration ||.

46 The poetical dialect different from that of proſe.

|| Inſtit. viii. 3. § 3.

The poetical dialect of modern Italy is ſo different from the proſaic, that perſons who can read the hiſtorians, and even ſpeak with tolerable fluency the language of that country, may yet find it difficult to conſtrue a page of Petrarch or Taſſo. Yet it is not probable, that Petrarch, whoſe works are a ſtandard of the Italian poetical diction §, made any material innovations in his native tongue. It is rather probable that he wrote it nearly as it was ſpoken in his time, that is, in the 14th century; omitting only harſh combinations, and taking that liberty which Homer probably, and Virgil certainly, took before him, of reviving ſuch old, but not obſolete expreſſions, as ſeemed peculiarly ſignificant and melodious; and poliſhing his ſtyle to that degree of elegance which human ſpeech, without becoming

§ Vicende della litteratura del Denina, cap. 4.

ming unnatural, may admit of, and which the genius of poetry, as an art ſubſervient to pleaſure, may be thought to require.

The French poetry in general is diſtinguiſhed from proſe rather by the rhime and the meaſure, than by any old or uncommon phraſeology. Yet the French, on certain ſubjects, imitate the ſtyle of their old poets, of Marot in particular; and may therefore be ſaid to have ſomething of a poetical dialect, though far leſs extenſive than the Italian, or even than the Engliſh. And it may be preſumed, that in future ages they will have more of this dialect than they have at preſent. This may be inferred from the very uncommon merit of ſome of their late poets, particularly Boileau and La Fontaine, who, in their reſpective departments, will continue to be imitated, when the preſent modes of French proſe are greatly changed: an event that, for all the pains they take to preſerve their language, muſt inevitably happen, and whereof there are not wanting ſome preſages already.

The Engliſh poetical dialect is not characteriſed by any peculiarities of inflection, nor by any great latitude in the uſe of foreign idioms. More copious it is, however, than one would at firſt imagine; as may appear from the following ſpecimen and obſervations.

47 Phraſes in Engliſh poetry not uſual in proſe.

(1.) A few Greek and Latin idioms are common in Engliſh poetry, which are ſeldom or never to be met with in proſe. QUENCHED OF HOPE. Shakeſpeare.—SHORN OF HIS BEAMS. Milton.—*Created thing* NOR VALUED HE NOR SHUN'D. Milton.—*'Tis thus we riot, while* WHO SOW IT STARVE. Pope.—*This day* BE BREAD AND PEACE MY LOT. Pope.—INTO WHAT PIT THOU SEE'ST FROM WHAT HEIGHT FALLEN. Milton. *He deceived the mother of mankind.* WHAT TIME HIS PRIDE HAD CAST HIM *out of heaven.* Milton.—Some of theſe, with others to be found in Milton, ſeem to have been adopted for the ſake of brevity, which in the poetical tongue is indiſpenſable. For the ſame reaſon, perhaps the articles *a* and *the* are ſometimes omitted by our poets, though leſs frequently in ſerious than burleſque compoſition.——In Engliſh, the adjective generally goes before the ſubſtantive, the nominative before the verb, and the active verb before (what we call) the accuſative. Exceptions, however, to this rule, are not uncommon even in proſe. But in poetry they are more frequent. *Their homely joys, and* DESTINY OBSCURE. *Now fades the glimmering landſcape on the ſight; and all the air a ſolemn ſtillneſs holds.* In general, that verſification may be leſs difficult, and the cadence more uniformly pleaſing; and ſometimes, too, in order to give energy to expreſſion, or vivacity to an image,—the Engliſh poet is permitted to take much greater liberties than the proſe-writer, in arranging his words, and modulating his lines and periods. Examples may be ſeen in every page of Paradiſe Loſt.

(2.) Some of our poetical words take an additional ſyllable, that they may ſuit the verſe the better; as, *diſpart, diſtain, diſport, affright, enchain,* for part, ſtain, ſport, fright, chain. Others ſeem to be nothing elſe than common words made ſhorter, for the convenience of the verſifier. Such are, *auxiliar, ſublunar, trump, vale, part, clime, ſubmiſs, frolic, plain, drear, dread, helm, morn, mead, eve* and *even, gan, illume* and *illumine, ope, hoar, bide, ſwage, ſcape;* for auxiliary, ſublunary, trumpet, valley, depart, climate, ſubmiſſive, frolicſome, complain, dreary, dreadful, helmet, morning, meadow, evening, began or began to, illuminate, open, hoary, abide, aſſuage, eſcape.——Of ſome of theſe the ſhort form is the more ancient. In Scotland, *even, morn, bide, ſwage,* are ſtill in vulgar uſe; but *morn,* except when contradiſtinguiſhed to *even,* is ſynonymous, not with *morning* (as in the Engliſh poetical dialect), but with *morrow.* The Latin poets, in a way ſomewhat ſimilar, and perhaps for a ſimilar reaſon, ſhortened *fundamentum, tutamentum, munimentum,* &c. into fundamen, tutamen, munimen.

(3.) Of the following words, which are now almoſt peculiar to poetry, the greater part are ancient, and were once no doubt in common uſe in England, as many of them ſtill are in Scotland. *Afield, amain, annoy* (a noun), *anon, aye* (ever), *beheſt, blithe, brand* (ſword), *bridal, carol, dame* (lady), *featly, fell* (an adjective), *gaude, gore, hoſt* (army), *lambkin, late* (of late), *lay* (poem), *lea, glade, gleam, hurl, lore, meed, oriſons, plod* (to travel laboriouſly), *ringlet, rue* (a verb) *ruth, ruthleſs, ſojourn* (a noun), *ſmite, ſpeed* (an active verb), *ſave* (except), *ſpray* (twig), *ſteed, ſtrain* (ſong), *ſtrand, ſwain, thrall, thrill, trail* (a verb), *troll, wail, welter, warble, wayward, woo, the while* (in the mean time), *yon, of yore.*

(4.) Theſe that follow are alſo poetical; but, ſo far as appears, were never in common uſe. *Appal, arrowy, attune, battailous, breezy, car* (chariot), *clarion, cates, courſer, darkling, flicker, floweret, emblaze, gairiſh, circlet, impearl, nightly, noiſeleſs, pinion* (wing), *ſhadowy, ſlumberous, ſtreamy, troublous, wilder* (a verb) *ſhrill* (a verb), *ſhook* (ſhaken), *madding, viewleſs.*—The following, too, derived from the Greek and Latin, ſeem peculiar to poetry. *Clang, clangor, choral, bland, boreal, dire, enſanguined, ire, ireful, lave* (to waſh), *nymph,* (lady, girl), *orient, panoply, philomel, infuriate, jocund, radiant, rapt, redolent, refulgent, verdant, vernal, zephyr, zone* (girdle), *ſylvan, ſuffuſe.*

(5.) In moſt languages, the rapidity of pronunciation abbreviates ſome of the commoneſt words, or even joins two, or perhaps more, of them, into one; and ſome of thoſe abbreviated forms find admiſſion into writing. The Engliſh language was quite diſfigured by them in the end of the laſt century; but Swift, by his ſatire and example, brought them into diſrepute: and, though ſome of them be retained in converſation, as *don't, ſhan't, can't,* they are now avoided in ſolemn ſtyle; and by elegant writers in general, except where the colloquial dialect is imitated, as in comedy. *'Tis* and *'twas,* ſince the time of Shafteſbury, ſeem to have been daily loſing credit, at leaſt in proſe; but ſtill have a place in poetry, perhaps becauſe they contribute to conciſeneſs. *'Twas on a lofty vaſe's ſide.* Gray.—*'Tis true, 'tis certain, man, though dead, retains part of himſelf.* Pope. In verſe too, *over* may be ſhortened into *o'er,* (which is the Scotch, and probably was the old Engliſh, pronunciation); *never* into *ne'er;* and from *the* and *to,* when they go before a word beginning with a vowel, the final letter is ſometimes cut off. *O'er hills, o'er dales, o'er crags, o'er rocks they go.* Pope.—*Where'er ſhe turns the Graces homage pay. And all that beauty, all that wealth e'er gave. Rich with the ſpoils of time did ne'er unroll.* Gray.—*T'alarm th' eternal midnight of the grave.*——Theſe abbreviations are now peculiar to the poetical tongue, but not neceſſary to it. They ſometimes

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ſometimes promote brevity, and render verſification leſs difficult.

(6.) Thoſe words which are commonly called *compound epithets*, as *roſy-finger'd, roſy-boſom'd, many-twinkling, many-ſounding, moſs-grown, bright-eyed, ſtraw-built, ſpirit-ſtirring, incenſe-breathing, heaven-taught, love-whiſpering, lute-reſounding*, are alſo to be conſidered as part of our poetical dialect. It is true, we have compounded adjectives in familiar uſe, as *high-ſeaſoned, well-natured, ill-bred*, and innumerable others. But we ſpeak of thoſe that are leſs common, that ſeldom occur except in poetry, and of which in proſe the uſe would appear

48 to be uſed ſparingly;

affected. And that they ſometimes promote brevity and vivacity of expreſſion, cannot be denied. But as they give, when too frequent, a ſtiff and finical air to a performance; as they are not always explicit in the ſenſe, nor agreeable in the ſound; as they are apt to produce a confuſion, or too great a multiplicity, of images; as they tend to disfigure the language, and furniſh a pretext for endleſs innovation; they ought to be uſed ſparingly; and thoſe only uſed which the practice of popular authors has rendered familiar to the ear, and which are in themſelves peculiarly emphatical and harmonious.

(7.) In the transformation of nouns into verbs and participles, our poetical dialect admits of greater latitude than proſe. Hymn, pillow, curtain, ſtory, pillar, picture, peal, ſurge, cavern, honey, career, cincture, boſom, ſphere, are common nouns; but *to hymn, to pillow, curtained, pillared, pictured, pealing, ſurging, cavern'd, honied, careering, cinctured, boſomed, ſphered*, would appear affected in proſe, and yet in verſe they are warranted by great authorities, though it muſt be confeſſed that they are cenſured by an able critic*, who had ſtudied the Engliſh language, both poetical and proſaic, with wonderful diligence.

* *Johnſon.*

Some late poets, particularly the imitators of Spenſer, have introduced a great variety of uncommon words, as certes, eftſoons, ne, whilom, tranſmew, moil, ſone, loſel, albe, hight, dight, pight, thews, couthful, affot, muchel, wend, arrear, &c. Theſe were once poetical words, no doubt; but they are now obſolete, and to many readers unintelligible. No man of the preſent age, however converſant in this dialect, would naturally expreſs himſelf in it on any intereſting emergence; or, ſuppoſing this natural to the antiquarian, it would never appear ſo to the common hearer or reader. A mixture of theſe words, therefore, muſt ruin the pathos of modern language: and as they are not familiar to our ear, and plainly appear to be ſought after and affected, will generally give a ſtiffneſs to modern verſification. Yet in ſubjects approaching to the ludicrous they may have a good effect; as in the *Schoolmiſtreſs* of Shenſtone, Parnel's Fairy-tale, Thomſon's Caſtle of Indolence, and Pope's lines in the Dunciad upon Wormius. But this effect will be moſt pleaſing to thoſe who have leaſt occaſion to recur to the gloſſary.

Indeed, it is not always eaſy to fix the boundary between poetical and obſolete expreſſions. To many readers, *lore, meed, beheſt, blithe, gaude, ſpray, thrall*, may already appear antiquated; and to ſome the ſtyle of Spenſer, or even of Chaucer, may be as intelligible as that of Dryden. This however we may venture to affirm, that a word, which the majority of readers cannot underſtand without a gloſſary, may with reaſon be conſidered as obſolete; and ought not to be uſed in modern compoſition, unleſs revived, and recommended to the public ear, by ſome very eminent writer. There are but few words in Milton, as *nathleſs, tine, frore, boſky*, &c.; there are but one or two in Dryden, as *falſify* (F); and in Pope, there are none at all, which every reader of our poetry may not be ſuppoſed to underſtand: whereas in Shakeſpeare, there are many, and in Spenſer many more, for which one who knows Engliſh very well may be obliged to conſult the dictionary. The practice of Milton, Dryden, or Pope, may therefore, in almoſt all caſes, be admitted as good authority for the uſe of a poetical word. And in them, all the words above enumerated, as poetical, and in preſent uſe, may actually be found. And of ſuch poets as may chooſe to obſerve this rule, it will not be ſaid, either that they reject the judgment of Quintilian, who recommends the neweſt of the old words, and the oldeſt of the new, or that they are inattentive to Pope's precept;

> Be not the firſt by whom the new are tried,
> Nor yet the laſt to lay the old aſide.
>
> *Eſſ. on Crit.* v. 335.

We muſt not ſuppoſe that theſe poetical words never occur at all except in poetry. Even from converſation they are not excluded: and the ancient critics allow, that they may be admitted into proſe, where they occaſionally confer dignity upon a ſublime ſubject, or heighten the ludicrous qualities of a mean one. But it is in poetry only where the frequent uſe of them does not ſavour of affectation.

Nor muſt we ſuppoſe them eſſential to this art. Many paſſages there are of exquiſite poetry, wherein not a ſingle phraſe occurs that might not be uſed in proſe. In fact, the influence of theſe words in adorning Engliſh verſe is not very extenſive. Some influence however they have. They ſerve to render the poetical ſtyle, firſt, more melodious; and, ſecondly, more ſolemn.

49 In which caſe they may render the poetical ſtyle more melodious.

Firſt, They render the poetical ſtyle more melodious, and more eaſily reducible into meaſure. Words of unwieldy ſize, or difficult pronunciation, are never uſed by correct poets, where they can be avoided: unleſs in their ſound they have ſomething imitative of the ſenſe. Homer's poetical inflections contribute wonderfully to the ſweetneſs of his numbers: and if the reader is pleaſed to look back to the ſpecimen above given of the Engliſh poetical dialect, he will find that the words are in general well ſounding, and ſuch as may coaleſce with other words, without producing harſh combinations. Quintilian obſerves, that poets, for the ſake of their verſe, are indulged in many liberties, not granted to the orator, of lengthening, ſhortening, and dividing their words*:—and if the Greek and Roman poets claimed this indulgence

* *Inſtit. Orat.* lib. x. cap. i. § 3.

(D) Dryden in one place (Æneid ix. verſe 1095.) uſes *Falſified* to denote *Pierced through and through*. He acknowledges, that this uſe of the word is an innovation; and has nothing to plead for it but his own authority, and that *Falſare* in Italian ſometimes means the ſame thing.

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gence from necessity, and obtained it, the English, those of them especially who write in rhyme, may claim it with better reason; as the words of their language are less musical and far less susceptible of variety in arrangement and syntax.

50 and solemn.

Secondly, Such poetical words as are known to be ancient have something venerable in their appearance, and impart a solemnity to all around them. This remark is from Quintilian; who adds, that they give to a composition that cast and colour of antiquity which in painting is so highly valued, but which art can never effectually imitate *. Poetical words that are either not ancient, or not known to be such, have, however, a pleasing effect from association. We are accustomed to meet with them in sublime and elegant writing; and hence they come to acquire sublimity and elegance: Even as the words we hear on familiar occasions come to be accounted familiar; and as those that take their rise among pick-pockets, gamblers, and gypsies, are thought too indelicate to be used by any person of taste or good manners. When one hears the following lines, which abound in poetical words,

> The breezy call of incense-breathing morn,
> The swallow twittering from the straw-built shed,
> The cock's shrill clarion, or the echoing horn,
> No more shall rouse them from their lowly bed:

—one is as sensible of the dignity of the language, as one would be of the vileness or vulgarity of that man's speech, who should prove his acquaintance with Bridewell, by interlarding his discourse with such terms as *milldoll, queer cull*, or *nabbing cheat* †; or who, in imitation of fops and gamblers, should on the common occasions of life, talk of being *bent hollow*, or *saving his distance* ‡. What gives dignity to persons gives dignity to language. A man of this character is one who has borne important employments, been connected with honourable associates, and never degraded himself by levity or immorality of conduct. Dignified phrases are those which have been used to express elevated sentiments, have always made their appearance in elegant composition, and have never been profaned by giving permanency or utterance to the passions of the vile, the giddy, or the worthless. And as by an active old age, the dignity of such men is confirmed and heightened; so the dignity of such words, if they be not suffered to fall into disuse, seldom fails to improve by length of time.

* Lib. viii. cap. 3.

† See the *Scoundrel's Dictionary*.

‡ Language of New-market.

Art. II. Of Tropes and Figures.

51 Tropes and figures necessary to poetical language,

If it appear that, by means of figures, language may be made more *pleasing* and more natural than it would be without them; it will follow, that to poetic language, whose end is to *please* by imitating *nature*, figures must be not only ornamental, but necessary. It will here be proper, therefore, first to point out the importance and utility of figurative language; secondly, to show, that figures are more necessary to poetry in general than to any other mode of writing.

I. *As to the importance and utility of figurative expression*, in making language more pleasing and more natural; it may be remarked,

(1.) That tropes and figures are often necessary to supply the unavoidable defects of language. When *proper* words are wanting, or not recollected, or when we do not choose to be always repeating them, we must have recourse to tropes and figures. When philosophers began to explain the operations of the mind, they found that most of the words in common use, being framed to answer the more obvious exigencies of life, were in their proper signification applicable to matter only and its qualities. What was to be done in this case? Would they think of making a new language to express the qualities of mind? No: that would have been difficult and impracticable; and granting it both practicable and easy, they must have foreseen, that nobody would read or listen to what was thus spoken or written in a new and consequently in an unknown tongue. They therefore took the language as they found it; and wherever they thought there was a similarity or analogy between the qualities of the mind and the qualities of matter, scrupled not to use the names of the material qualities tropically, by applying them to the mental qualities. Hence came the phrases *solidity* of judgment, *warmth* of imagination, *enlargement* of understanding, and many others; which, though figurative, express the meaning just as well as proper words would have done. In fact, numerous as the words in every language are, they must always fall short of the unbounded variety of human thoughts and perceptions. Tastes and smells are almost as numerous as the species of bodies. Sounds admit of perceptible varieties that surpass all computation, and the seven primary colours may be diversified without end. If each variety of external perception were to have a name, language would be insurmountably difficult; nay, if men were to appropriate a class of names to each particular sense, they would multiply words exceedingly, without adding any thing to the clearness of speech. Those words, therefore, that in their proper signification denote the objects of one sense, we often apply tropically to the objects of another, and say, Sweet taste, sweet smell, sweet sound; sharp point, sharp taste, sharp sound; harmony of sounds, harmony of colours, harmony of parts; soft silk, soft colour, soft sound, soft temper; and so in a thousand instances: and yet these words, in their tropical signification, are not less intelligible than in their proper one; for sharp taste and sharp sound, are as expressive as sharp sword; and harmony of tones is not better understood by the musician, than harmony of parts by the architect, and harmony of colours by the painter.

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52 to supply the defects of simple language; and

Savages, illiterate persons, and children, have comparatively but few words in proportion to the things they may have occasion to speak of; and must therefore recur to tropes and figures more frequently than persons of copious elocution. A seaman, or mechanic, even when he talks of that which does not belong to his art, borrows his language from that which does; and this makes his diction figurative to a degree that is sometimes entertaining enough. "Death (says a seaman in one of Smollet's novels) has not yet *boarded* my comrade; but they have been *yard-arm and yard-arm* these three *glasses*. His *starboard* eye is open, but fast *jammed* in his head; and the *haulyards* of his under jaw have given way." These phrases are exaggerated; but we allow them to be natural, because we know that illiterate people are apt to make use of tropes and figures taken from their own trade, even when they speak of things that are very remote and incongruous. In those poems, therefore, that imitate the conversation of illiterate persons, as in comedy, farce, and pastoral, such figures judiciously

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diciouſly applied may render the imitation more pleaſing, becauſe more exact and natural.

53 to avoid harſhneſs of diction.

Words that are untuneable and harſh, the poet is often obliged to avoid, when perhaps he has no other way to expreſs their meaning than by tropes and figures; and ſometimes the meaſure of his verſe may oblige him to reject a proper word that is not harſh, merely on account of its being too long, or too ſhort, or in any other way unſuitable to the rhythm, or to the rhyme. And hence another uſe of figurative language, that it contributes to poetical harmony. Thus *to preſs the plain*, is frequently uſed to ſignify *to be ſlain in battle*; *liquid plain* is put for *ocean*, *blue ſerene* for *ſky*, and *ſylvan reign* for *country life*.

54 Tropes and figures favourable to delicacy;

(2.) Tropes and figures are favourable to delicacy. When the proper name of a thing is in any reſpect unpleaſant, a well choſen trope will convey the idea in ſuch a way as to give no offence. This is agreeable, and even neceſſary, in polite converſation, and cannot be diſpenſed with in elegant writing of any kind. Many words, from their being often applied to vulgar uſe, acquire a meanneſs that diſqualifies them for a place in ſerious poetry; while perhaps, under the influence of a different ſyſtem of manners, the correſponding words in another language may be elegant, or at leaſt not vulgar. When one reads Homer in the Greek, one takes no offence at his calling Eumeus by a name which, literally rendered, ſignifies *ſwine-herd*; firſt, becauſe the Greek word is well-ſounding in itſelf; ſecondly, becauſe we have never heard it pronounced in converſation, nor conſequently debaſed by vulgar uſe; and, thirdly, becauſe we know, that the office denoted by it was, in the age of Eumeus, both important and honourable. But Pope would have been blamed, if a name ſo indelicate as *ſwine-herd* had in his tranſlation been applied to ſo eminent a perſonage; and therefore he judiciouſly makes uſe of the trope *ſynecdoche*, and calls him *ſwain* *; a word both elegant and poetical, and not likely to lead the reader into any miſtake about the perſon ſpoken of, as his employment had been deſcribed in a preceding paſſage. The ſame Eumeus is ſaid, in the ſimple but melodious language of the original, to have been making his own ſhoes when Ulyſſes came to his door; a work which in thoſe days the greateſt heroes would often find neceſſary. This, too, the tranſlator ſoftens by a tropical expreſſion:

* *Odyſſey*, book xiv. ver. 41.

Here ſat Eumeus, and his cares applied,
To form ſtrong *buſkins* of well ſeaſoned hide.

A hundred other examples might be quoted from this tranſlation; but thoſe will explain our meaning.

There are other occaſions on which the delicacy of figurative language is ſtill more needful; as in Virgil's account of the effects of animal love, and of the plague among the beaſts, in the third Georgic; where Dryden's ſtyle, by being leſs figurative than the original, is in one place exceedingly filthy, and in another ſhockingly obſcene.

Hobbes could conſtrue a Greek author; but his ſkill in words muſt have been all derived from the dictionary; for he ſeems not to have known that any one articulate ſound could be more agreeable, or any one phraſe more dignified than another. In his Iliad and Odyſſey, even when he hits the author's ſenſe (which is not always the caſe), he proves, by his choice of words, that of harmony, elegance, or energy of ſtyle, he had no manner of conception. And hence that work, though called a *Tranſlation of Homer*, does not even deſerve the name of *poem*; becauſe it is in every reſpect unpleaſing, being nothing more than a fictitious narrative delivered in a mean proſe, with the additional meanneſs of harſh rhyme and untuneable meaſure.—Trapp underſtood Virgil well enough as a grammarian, and had a taſte for his beauties: yet his tranſlation bears no reſemblance to Virgil; which is owing to the ſame cauſe, an imprudent choice of words and figures, and a total want of harmony.

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55 which, however, may be carried too far.

The delicacy we here contend for may, indeed, both in converſation and in writing, be carried too far. To call *killing an innocent man in a duel* an affair of honour, and *a violation of the rights of wedlock* an affair of gallantry, is a proſtitution of figurative language. Nor is it any credit to us, that we are ſaid to have upwards of 40 figurative phraſes to expreſs exceſſive drinking. Language of this ſort generally implies, that the public abhorrence of ſuch crimes is not ſo ſtrong as it ought to be: and it is a queſtion, whether even our morals might not be improved, if we were to call theſe and ſuch like crimes by their proper names, *murder*, *adultery*, *drunkenneſs*, *gluttony*; names that not only expreſs our meaning, but alſo betoken our diſapprobation.—As to writing, it cannot be denied, that even Pope himſelf, in the excellent verſion juſt now quoted, has ſometimes, for the ſake of his numbers, or for fear of giving offence by too cloſe an imitation of Homer's ſimplicity, employed tropes and figures too quaint or too ſolemn for the occaſion. And the finical ſtyle is in part characteriſed by the writer's diſlike to literal expreſſions, and affectedly ſubſtituting in their ſtead unneceſſary tropes and figures. With theſe authors, a man's only child muſt always be his *only hope*; a country maid becomes *a rural beauty*, or perhaps a *nymph of the groves*; if flattery ſing at all, it muſt be a *ſyren ſong*; the ſhepherd's flute dwindles into an *oaten reed*, and his crook is exalted into a *ſceptre*; the *ſilver lilies* riſe from their *golden beds*, and *languiſh* to the *complaining* gale. A young woman, though a good Chriſtian, cannot make herſelf agreeable without *ſacrificing to the Graces*; nor hope to do any execution among the *gentle ſwains*, till a whole legion of *Cupids*, armed with *flames* and *darts*, and other weapons, begin to diſcharge from her eyes their formidable artillery. For the ſake of variety, or of the verſe, ſome of theſe figures may now and then find a place in a poem; but in proſe, unleſs very ſparingly uſed, they ſavour of affectation.

56 Tropes and figures promote brevity, and

(3.) Tropes and figures promote brevity; and brevity, united with perſpicuity, is always agreeable. An example or two will be given in the next paragraph. Sentiments thus delivered, and imagery, thus painted, are readily apprehended, by the mind, make a ſtrong impreſſion upon the fancy, and remain long in the memory; whereas too many words, even when the meaning is good, never fail to bring diſguſt and wearineſs. They argue a debility of mind which hinders the author from ſeeing his thoughts in one diſtinct point of view; and they alſo encourage a ſuſpicion, that there is ſomething faulty or defective in the matter. In the poetic ſtyle, therefore, which is addreſſed to the fancy and paſſions, and intended to make a vivid, a pleaſing, and a permanent impreſſion, brevity, and conſequently tropes and figures, are indiſpenſable. And a language will always be

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be the better suited to poetical purposes, the more it admits of this brevity;—a character which is more conspicuous in the Greek and Latin than in any modern tongue, and much less in the French than in the Italian or English.

57
Contribute to strength and energy of language.

(4.) Tropes and figures contribute to strength or energy of language, not only by their conciseness, but also by conveying to the fancy ideas that are easily comprehended, and make a strong impression. We are powerfully affected with what we see, or feel, or hear. When a sentiment comes enforced or illustrated by figures taken from objects of sight, or touch, or hearing, one thinks, as it were, that one sees, or feels, or hears, the thing spoken of; and thus, what in itself would perhaps be obscure, or is merely intellectual, may be made to seize our attention and interest our passions almost as effectually as if it were an object of outward sense. When Virgil calls the Scipios *thunderbolts of war*, he very strongly expresses in one word, and by one image, the rapidity of their victories, the noise their atchievements made in the world, and the ruin and consternation that attended their irresistible career.—When Homer calls Ajax *the bulwark of the Greeks*, he paints with equal brevity his vast size and strength, the difficulty of prevailing against him, and the confidence wherewith his countrymen reposed on his valour.—When Solomon says of the strange woman, or harlot, that "her feet go *down* to death," he lets us know, not only that her path ends in destruction, but also, that they who accompany her will find it easy to go forwards to ruin, and difficult to return to their duty.—Satan's enormous magnitude, and refulgent appearance, his perpendicular ascent through a region of darkness, and the inconceivable rapidity of his motion, are all painted out to our fancy by Milton, in one very short similitude,

> Sprung upward, like—a pyramid of fire.
> *Par. Lost.* iv. 1013.

To take in the full meaning of which figure, we must imagine ourselves in chaos, and a vast luminous body rising upwards, near the place where we are, so swiftly as to appear a continued track of light, and lessening to the view according to the increase of distance, till it end in a point, and then disappear; and all this must be supposed to strike our eye at one instant.——Equal to this in propriety, though not in magnificence, is that allegory of Gray,

> The paths of glory lead but to the grave:

Which presents to the imagination a wide plain, where several roads appear, crowded with glittering multitudes, and issuing from different quarters, but drawing nearer and nearer as they advance, till they terminate in the dark and narrow house, where all their glories enter in succession, and disappear for ever.——When it is said in Scripture, of a good man who died, that he *fell asleep*, what a number of ideas are at once conveyed to our imagination, by this beautiful and expressive figure: As a labourer, at the close of day, goes to sleep, with the satisfaction of having performed his work, and with the agreeable hope of awaking in the morning of a new day, refreshed and cheerful; so a good man, at the end of life, resigns himself calm and contented to the will of his Maker, with the sweet reflection of having endeavoured to do his duty, and with the transporting hope of soon awaking in the regions of light, to life and happiness eternal. The figure also suggests, that to a good man the transition from life to death is, even in the sensation, no more painful, than when our faculties melt away into the pleasing insensibility of sleep.——Satan, flying among the stars, is said by Milton to "*sail* between worlds and worlds;" which has an elegance and force far superior to the proper word *fly*. For by this allusion to a ship, we are made to form a lively idea of his great size, and to conceive of his motion, that it was equable and majestic.——Virgil uses a happy figure to express the size of the great wooden horse, by means of which the Greeks were conveyed into Troy: "Equum divina Palladis arte *ædificant*."——Milton is still bolder when he says,

> Who would not sing for Lycidas! he knew
> Himself to sing, and *build the lofty rhyme*.

The phrase, however, though bold, is emphatical; and gives a noble idea of the durability of poetry, as well as of the art and attention requisite to form a good poem.——There are hundreds of tropical expressions in common use, incomparably more energetic than any proper words of equal brevity that could be put in their place. A cheek *burning* with blushes, is a trope which at once describes the colour as it appears to the beholder, and the glowing heat as it is felt by the person blushing. *Chilled* with despondence, *petrified* with astonishment, *thunderstruck* with disagreeable and unexpected intelligence, *melted* with love or pity, *dissolved* in luxury, *hardened* in wickedness, *softening* into remorse, *inflamed* with desire, *tossed* with uncertainty, &c.—every one is sensible of the force of these and the like phrases, and that they must contribute to the energy of composition.

58
They are likewise the language of strong passion.

(5.) Tropes and figures promote strength of expression; and are in poetry peculiarly requisite, because they are often more *natural*, and more *imitative*, than proper words. In fact, this is so much the case, that it would be impossible to imitate the language of passion without them. It is true, that when the mind is agitated, one does not run out into allegories, or long-winded similitudes, or any of the figures that require much attention and many words, or that tend to withdraw the fancy from the object of the passion. Yet the language of many passions must be figurative notwithstanding; because they rouse the fancy, and direct it to objects congenial to their own nature, which diversify the language of the speaker with a multitude of allusions. The fancy of a very angry man, for example, presents to his view a train of disagreeable ideas connected with the passion of anger, and tending to encourage it; and if he speak without restraint during the paroxysm of his rage, those ideas will force themselves upon him, and compel him to give them utterance. "Infernal monster! (he will say),—my blood boils at him: he has used me like a dog; never was man so injured as I have been by this barbarian. He has no more sense of propriety than a stone. His countenance is diabolical, and his soul as ugly as his countenance. His heart is cold and hard, and his resolutions dark and bloody," &c. This speech is wholly figurative. It is made up of *metaphors* and *hyperboles*, which, with the *prosopopeia* and *apostrophe*, are the most passionate of all the figures. Lear, driven out of doors by his unnatural daughters, in the midst of darkness, thunder, and tempest, naturally

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rally breaks forth (for his indignation is just now raised to the very highest pitch) into the following violent exclamation against the crimes of mankind, in which almost every word is figurative.

Tremble, thou wretch,
That haſt within thee undivulged crimes
Unwhipt of juſtice. Hide thee, thou bloody hand,
Thou perjur'd, and thou ſimular of virtue,
That art inceſtuous. Caitiff, to pieces ſhake,
That under covert, and convenient ſeeming,
Haſt practis'd on man's life. Cloſe pent-up guilts,
Rive your concealing continents, and cry
Theſe dreadful ſummoners grace. *King Lear.*

——The vehemence of maternal love, and ſorrow from the apprehenſion of loſing her child, make the Lady Conſtance utter a language that is ſtrongly figurative, though quite ſuitable to the condition and character of the ſpeaker. The paſſage is too long for a quotation, but concludes thus:

O Lord! my boy, my Arthur, my fair ſon,
My life, my joy, my food, my all the world,
My widow-comfort, and my ſorrow's cure. *King John.*

——Similar to this, and equally expreſſive of conjugal love, is that beautiful hyperbole in Homer; where Andromache, to diſſuade her huſband from going out to the battle, tells him that ſhe had now no mother, father, or brethren, all her kindred being dead, and her native country deſolate; and then tenderly adds,

But while my Hector yet ſurvives, I ſee
My father, mother, brethren, all in thee. *Iliad*, b. vi.

59 The ſimpleſt language moſt ſuitable to depreſſing paſſions,

As the paſſions that agitate the ſoul, and rouſe the fancy, are apt to vent themſelves in tropes and figures, ſo thoſe that depreſs the mind adopt for the moſt part a plain diction, without any ornament: for to a dejected mind, wherein the imagination is generally inactive, it is not probable that any great variety of ideas will preſent themſelves; and when theſe are few and familiar, the words that expreſs them muſt be ſimple. As no author equals Shakeſpeare in boldneſs or variety of figures when he copies the ſtyle of thoſe violent paſſions that ſtimulate the fancy; ſo, when he would exhibit the human mind in a dejected ſtate, no uninſpired writer excels him in ſimplicity. The ſame Lear whoſe reſentment had impaired his underſtanding, while it broke out in the moſt boiſterous language, when, after ſome medical applications, he recovers his reaſon, his rage being now exhauſted, his pride humbled, and his ſpirits totally depreſſed, ſpeaks in a ſtyle than which nothing can be imagined more ſimple or more affecting.

Pray, do not mock me:
I am a very fooliſh, fond old man,
Fourſcore and upward; and, to deal plainly with you,
I fear I am not in my perfect mind.
Methinks I ſhould know you, and know this man;
Yet I am doubtful: for I am mainly ignorant
What place this is; and all the ſkill I have
Remembers not theſe garments: nor I know not
Where I did lodge laſt night. *Lear*, act iv. ſc. 7.

——Deſdemona, ever gentle, artleſs, and ſincere, ſhocked at the unkindneſs of her huſband, and overcome with melancholy, ſpeaks in a ſtyle ſo beautifully ſimple, and ſo perfectly natural, that one knows not what to ſay in commendation of it:

My mother had a maid call'd Barbara;
She was in love, and he ſhe lov'd prov'd falſe,
And did forſake her. She had a ſong of willow;
An old thing it was, but it expreſs'd her fortune,
And ſhe died ſinging it. That ſong to-night
Will not go from my mind: I have much to do,
But to go hang my head all at one ſide,
And ſing it like poor Barbara. *Othello*, act iv. ſc. 3.

Sometimes the imagination, even when exerted to the utmoſt, takes in but few ideas. This happens when the attention is totally engroſſed by ſome very great object; admiration being one of thoſe emotions that rather ſuſpend the exerciſe of the faculties than puſh them into action. And here, too, the ſimpleſt language is the moſt natural; as when Milton ſays of the Deity, 60
that he ſits "high-throned above all height." And as this ſimplicity is more ſuitable to that one great exertion which occupies the ſpeaker's mind than a more elaborate imagery or language would have been, ſo has it alſo a more powerful effect in fixing and elevating the imagination of the hearer; for to introduce other thoughts for the ſake of illuſtrating what cannot be illuſtrated, could anſwer no other purpoſe than to draw off the attention from the principal idea. In theſe and the like caſes, the fancy left to itſelf will have more ſatisfaction in purſuing at leiſure its own ſpeculations than in attending to thoſe of others; as they who ſee for the firſt time ſome admirable object would chooſe rather to feaſt upon it in ſilence, than to have their thoughts interrupted by a long deſcription from another perſon, informing them of nothing but what they ſee before them, are already acquainted with, or may eaſily conceive.

and to the ſentiment of admiration.

It was remarked above that the *hyperbole*, *proſopopœia*, and *apoſtrophe*, are among the moſt paſſionate figures. This deſerves illuſtration.

61 Hyperbole natural to the paſſion of anger, love, fear, &c.

1ſt, A very angry man is apt to think the injury he has juſt received greater than it really is; and if he proceed immediately to retaliate by word or deed, ſeldom fails to exceed the due bounds, and to become injurious in his turn. The fond parent looks upon his child as a prodigy of genius and beauty; and the romantic lover will not be perſuaded that his miſtreſs has nothing ſupernatural either in her mind or perſon. Fear, in like manner, not only magnifies its object when real, but even forms an object out of nothing, and miſtakes the fictions of fancy for the intimations of ſenſe.—No wonder, then, that they who ſpeak according to the impulſe of paſſion ſhould ſpeak *hyperbolically*; that the angry man ſhould exaggerate the injury he has received, and the vengeance he is going to inflict; that the ſorrowful ſhould magnify what they have loſt, and the joyful what they have obtained; that the lover ſhould ſpeak extravagantly of the beauty of his miſtreſs, the coward of the dangers he has encountered, and the credulous clown of the miracles performed by the juggler. In fact, theſe people would not do juſtice to what they feel if they did not ſay more than the truth. The valiant man, on the other hand, as naturally adopts the diminiſhing hyperbole when he ſpeaks of danger; and the man of ſenſe, when he is obliged to mention his own virtue or ability; becauſe it appears to him, or he is willing to conſider

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consider it, as less than the truth, or at best as inconsiderable. Contempt uses the same figure; and therefore Petruchio, affecting that passion, affects also the language of it:

> Thou liest, thou thread, thou thimble,
> Thou yard, three-quarters, half-yard, quarter, nail,
> Thou flea, thou nit, thou winter-cricket, thou!
> Brav'd in mine own house with a skein of thread!
> Away, thou rag, thou quantity, thou remnant!
>
> *Taming of the Shrew*, act iv. sc. 1.

For some passions consider their objects as important, and others as unimportant. Of the former sort are anger, love, fear, admiration, joy, sorrow, pride; of the latter are contempt and courage. Those may be said to subdue the mind to the object, and these to subdue the object to the mind. And the former, when violent, always magnify their objects: whence the hyperbole called amplification, or *auxesis*: and the latter as constantly diminish theirs; and give rise to the hyperbole called *meiosis*, or diminution.—Even when the mind cannot be said to be under the influence of any violent passion, we naturally employ the same figure when we would impress another very strongly with any idea. "He is a walking shadow: he is worn to skin and bone: he has one foot in the grave and the other following:"—these, and the like phrases, are proved to be natural by their frequency. By introducing great ideas, the hyperbole is further useful in poetry as a source of the sublime; but when employed injudiciously is very apt to become ridiculous. Cowley makes Goliah as big as the hill down which he was marching*; and tells us, that when he came into the valley he seemed to fill it, and to overtop the neighbouring mountains (which, by the by, seems rather to lessen the mountains and valleys than to magnify the giant): nay, he adds, that the sun started back when he saw the splendour of his arms. This poet seems to have thought that the figure in question could never be sufficiently enormous; but Quintilian would have taught him, "Quamvis omnis hyperbole ultra fidem, non tamen esse debet ultra modum." The reason is, that this figure, when excessive, betokens rather absolute infatuation than intense emotion; and resembles the efforts of a ranting tragedian, or the ravings of an enthusiastic declaimer, who, by putting on the gestures and looks of a lunatic, satisfy the discerning part of their audience, that, instead of feeling strongly, they have no rational feelings at all. In the wildest energies of nature there is a modesty which the imitative artist will be careful never to overstep.

* Davideis, book iii.

62 Prosopopœia, when proper.

2dly, That figure, by which things are spoken of as if they were persons, is called *prosopopœia*, or *personification*. It is a bold figure, and yet is often natural. Long acquaintance recommends to some share in our affection even things inanimate, as a house, a tree, a rock, a mountain, a country; and were we to leave such a thing without hope of return, we should be inclined to address it with a farewel, as if it were a percipient creature. Hence it was that Mary queen of Scotland, when on her return to her own kingdom, so affectionately bade adieu to the country which she had left. "Farewel France," said she, "farewel, beloved country, which I shall never more behold!" Nay, we find that ignorant nations have actually worshipped such things, or considered them as the haunt of certain powerful beings. Dryads and hamadryads were by the Greeks and Romans supposed to preside over trees and groves; river gods and nymphs, over streams and fountains; little deities, called *Lares* and *Penates*, were believed to be the guardians of hearths and houses. In Scotland there is hardly a hill remarkable for the beauty of its shape, that was not in former times thought to be the habitation of fairies. Nay, modern as well as ancient superstition has appropriated the waters to a peculiar sort of demon or goblin, and people the very regions of death, the tombs and charnel-houses, with multitudes of ghosts and phantoms.—Besides, when things inanimate make a strong impression upon us, whether agreeable or otherwise, we are apt to address them in terms of affection or dislike. The sailor blesses the plank that brought him ashore from the shipwreck; and the passionate man, and sometimes even the philosopher, will say bitter words to the stumbling block that gave him a fall.—Moreover, a man agitated with any interesting passion, especially of long continuance, is apt to fancy that all nature sympathises with him. If he has lost a beloved friend, he thinks the sun less bright than at other times; and in the sighing of the winds and groves, in the lowings of the herd, and in the murmurs of the stream, he seems to hear the voice of lamentation. But when joy or hope predominate, the whole world assumes a gay appearance. In the contemplation of every part of nature, of every condition of mankind, of every form of human society, the benevolent and the pious man, the morose and the cheerful, the miser and the misanthrope, finds occasion to indulge his favourite passion, and sees, or thinks he sees, his own temper reflected back in the actions, sympathies, and tendencies of other things and persons. Our affections are indeed the medium through which we may be said to survey ourselves, and every thing else; and whatever be our inward frame, we are apt to perceive a wonderful congeniality in the world without us. And hence the fancy, when roused by real emotions, or by the pathos of composition, is easily reconciled to those figures of speech that ascribe sympathy, perception, and the other attributes of animal life, to things inanimate, or even to notions merely intellectual. —Motion, too, bears a close affinity to action, and affects our imagination nearly in the same manner; and we see a great part of nature in motion, and by its sensible effects are led to contemplate energies innumerable. These conduct the rational mind to the Great First Cause; and these, in times of ignorance, disposed the vulgar to believe in a variety of subordinate agents employed in producing those appearances that could not otherwise be accounted for. Hence an endless train of fabulous deities, and of witches, demons, fairies, genii; which, if they prove our reason weak, and our fancy strong, prove also that personification is natural to the human mind; and that a right use of this figure may have a powerful effect, in fabulous writing especially, to engage our sympathy in behalf of things as well as persons: for nothing can give lasting delight to a moral being, but that which awakens sympathy, and touches the heart; and though it be true that we sympathise in some degree even with inanimate things, yet what has, or is supposed to have, life, calls forth a more sincere and more permanent fellow-feeling.—Let it be observed further, that to awaken our sympathetic feelings, a lively conception of their object is necessary. This indeed is true of almost all our emotions; their keenness is in proportion

portion to the vivacity of the perceptions that excite them. Distress that we see is more affecting than what we only hear of *; a perusal of the gayest scenes in a comedy does not rouse the mind so effectually as the presence of a cheerful companion; and the death of a friend is of greater energy in producing seriousness, and the consideration of our latter end, than all the pathos of Young. Of descriptions addressed to the fancy, those that are most vivid and picturesque will generally be found to have the most powerful influence over our affections; and those that exhibit persons engaged in action, and adorned with visible insignia, give a brisker impulse to the faculties than such as convey intellectual ideas only, or images taken from still life. No abstract notion of time, or of love, can be so striking to the fancy as the image of an old man accoutred with a scythe, or of a beautiful boy with wings and a bow and arrows: and no physiological account of frenzy could suggest so vivid an idea as the poet has given us in that exquisite portrait,

* Hor. Ar. Poet. v. 180.

And moody madness laughing wild amid severest wo.

And for this reason partly it is that the epic poet, in order to work the more effectually upon our passions and imagination, refers the secret springs of human conduct, and the vicissitudes of human affairs, to the agency of personified causes; that is, to the machinery of gods and goddesses, angels, demons, magicians, and other powerful beings. And hence, in all sublime poetry, life and motion, with their several modes and attributes, are liberally bestowed on those objects wherewith the author intends that we should be strongly impressed: scenes perfectly inanimate and still, tending rather to diffuse a languor over the mind than to communicate to our internal powers those lively energies without which a being essentially active can never receive complete gratification. —Lastly, some violent passions are peculiarly inclined to change things into persons. The horrors of his mind haunted Orestes in the shape of furies. Conscience, in the form of the murdered person, stares the murderer in the face, and often terrifies him to distraction. The superstitious man, travelling alone in the dark, mistakes a white stone for a ghost, a bush for a demon, a tree waving with the wind for an enormous giant brandishing a hundred arms. The lunatic and enthusiast converse with persons who exist only in their own distempered fancy; and the glutton and the miser, if they were to give utterance to all their thoughts, would often, it is presumable, speak, the one of his gold, the other of his belly, not only as a person, but as a god,—the object of his warmest love and most devout regard.—More need not be said to prove that personification is natural, and may frequently contribute to the pathos, energy, and beauty of poetic language.

63 Apostrophe how to be used.

3dly, *Apostrophe*, or a sudden diversion of speech from one person to another person or thing, is a figure nearly related to the former. Poets sometimes make use of it, in order to help out their verse, or merely to give variety to their style: but on these occasions it is to be considered as rather a trick of art, than an effort of nature. It is most natural, and most pathetic, when the person or thing to whom the apostrophe is made, and for whose sake we give a new direction to our speech, is in our eyes eminently distinguished for good or evil, or raises within us some sudden and powerful emotion, such as the hearer would acquiesce in, or at least acknowledge to be reasonable. But this, like the other pathetic figures, must be used with great prudence. For if, instead of calling forth the hearer's sympathy, it should only betray the levity of the speaker, or such wanderings of his mind as neither the subject nor the occasion would lead one to expect, it will then create disgust instead of approbation. The orator, therefore, must not attempt the passionate apostrophe, till the minds of the hearers be prepared to join in it. And every audience is not equally obsequious in this respect. In the forum of ancient Rome that would have passed for sublime and pathetic, which in the most respectable British auditories would appear ridiculous. For our style of public speaking is cool and argumentative; and partakes less of enthusiasm than the Roman did, and much less than the modern French or Italian. Of British eloquence, particularly that of the pulpit, the chief recommendations are gravity and simplicity. And it is vain to say, that our oratory *ought* to be more vehement: for that matter depends on causes, which it is not only inexpedient, but impossible to alter; namely, on the character and spirit of the people, and their rational notions in regard to religion, policy, and literature. The exclamations of Cicero would weigh but little in our parliament; and many of those which we meet with in French sermons would not be more effectual if attempted in our pulpit. To see one of our preachers, who the moment before was a cool reasoner, a temperate speaker, an humble Christian, and an orthodox divine, break out into a sudden apostrophe to the immortal powers, or to the walls of the church, tends to force a smile, rather than a tear, from those among us who reflect, that there is nothing in the subject, and should be nothing in the orator, to warrant such wanderings of fancy or vehemence of emotion. If he be careful to cultivate a pure style, and a grave and graceful utterance, a British clergyman, who speaks from conviction the plain unaffected words of truth and soberness, of benevolence and piety, will, it is believed, convey more pathetic, as well as more permanent, impressions to the heart, and be more useful as a Christian teacher, than if he were to put in practice all the attitudes of Roscius, and all the tropes and figures of Cicero.

But where the language of passion and enthusiasm is permitted to display itself, whatever raises any strong emotion, whether it be animate or inanimate, absent or present, sensible or intellectual, may give rise to the apostrophe. A man in a distant country, speaking of the place of his birth, might naturally exclaim, "O my dear native land, shall I never see thee more!" Or, when some great misfortune befals him, "Happy are ye, O my parents, that ye are not alive to see this." We have a beautiful apostrophe in the third book of the Æneid, where Æneas, who is telling his story to Dido, happening to mention the death of his father, makes a sudden address to him as follows:

———hic, pelagi tot tempestatibus actus,
Heu, genitorem, omnis curæ casusque levamen,
Amitto Anchisen:—hic me, pater optime, fessum
Deseris, heu, tantis nequicquam erepte periclis!

This apostrophe has a pleasing effect. It seems to intimate, that the love which the hero bore his father was so great, that when he mentioned him he forgot every thing

Of Tropes and Figures.

thing else; and, without minding his company, one of whom was a queen, suddenly addressed himself to that which, though present only in idea, was still a principal object of his affection. An emotion so warm and so reasonable cannot fail to command the sympathy of the reader.——When Michael, in the eleventh book of Paradise Lost, announces to Adam and Eve the necessity of their immediate departure from the garden of Eden, the poet's art in preserving the decorum of the two characters is very remarkable. Pierced to the heart at the thought of leaving that happy place, Eve, in all the violence of ungovernable sorrow, breaks forth into a pathetic apostrophe to Paradise, to the flowers she had reared, and to the nuptial bower she had adorned. Adam makes no address to the walks, the trees, or the flowers of the garden, the loss whereof did not so much afflict him; but, in his reply to the Archangel, expresses, without a figure, his regret for being banished from a place where he had been so often honoured with a sensible manifestation of the divine presence. The use of the apostrophe in the one case, and the omission of it in the other, not only gives a beautiful variety to the style, but also marks that superior elevation and composure of mind, by which the poet had all along distinguished the character of Adam.—One of the finest applications of this figure that is anywhere to be seen, is in the fourth book of the same poem; where the author, catching by sympathy the devotion of our first parents, suddenly drops his narrative, and joins his voice to theirs in adoring the Father of the universe.

Thus at their shady lodge arriv'd, both stood,
Both turn'd, and under open sky ador'd
The God that made both sky, air, earth, and heav'n,
Which they beheld, the moon's resplendent globe,
And starry pole:—Thou also mad'st the night,
Maker omnipotent! and thou the day,
Which we in our appointed work employ'd
Have finish'd.———

Milton took the hint of this fine contrivance from a well-known passage of Virgil:

Hic juvenum chorus, ille senum; qui carmine laudes
Herculeas et facta ferant;———
———ut duros mille labores
Rege sub Eurystheo, fatis Junonis iniquae,
Pertulerit:—Tu nubigenas, invicte, bimembres,
Hylæumque, Pholumque manu, tu Cresia mactas
Prodigia.———

The beauty arising from diversified composition is the same in both, and very great in each. But every reader must *feel*, that the figure is incomparably more affecting to the mind in the imitation than in the original. So true it is, that the most rational emotions raise the most intense fellow-feeling; and that the apostrophe is then the most emphatical, when it displays those workings of human affection which are at once ardent and well-founded.

64 Tropes and figures are useful, as they suggest an endless variety of agreeable images.

To conclude this head: Tropes and figures, particularly the *metaphor*, *similitude*, and *allegory*, are further useful in beautifying language, by suggesting, together with the thoughts essential to the subject, an endless variety of agreeable images, for which there would be no place, if writers were always to confine themselves to the *proper* names of things. And this beauty and variety, judiciously applied, is so far from distracting, that it tends rather to fix the attention, and captivate the heart of the readers, by giving light, and life, and pathos, to the whole composition.

II. That tropes and figures are more necessary to poetry, than to any other mode of writing, was the second point proposed to be illustrated in this section.

65 Tropes and figures more necessary to poetry than to any other mode of writing.

Language, as already observed, is then natural, when it is suitable to the supposed condition of the speaker. Figurative language is peculiarly suitable to the supposed condition of the poet; because figures are suggested by the fancy; and the fancy of him who composes poetry is more employed than that of any other author. Of all historical, philosophical, and theological researches, the object is *real* truth, which is fixed and permanent. The aim of rhetorical declamation (according to Cicero) is *apparent* truth; which, being less determinate, leaves the fancy of the speaker more free, gives greater scope to the inventive powers, and supplies the materials of a more figurative phraseology. But the poet is subject to no restraints, but those of verisimilitude; which is still less determinate than rhetorical truth. He seeks not to convince the judgment of his reader by arguments of either real or apparent cogency; he means only to please and interest him, by an appeal to his sensibility and imagination. His own imagination is therefore continually at work, ranging through the whole of real and probable existence, "glancing from heaven to earth, from earth to heaven," in quest of images and ideas suited to the emotions he himself feels, and to the sympathies he would communicate to others. And, consequently, figures of speech, the offspring of excursive fancy, must (if he speak according to what he is supposed to think and feel, that is, according to his supposed condition) tincture the language of the poet more than that of any other composer. So that, if figurative diction be unnatural in geometry, because all wanderings of fancy are unsuitable, and even impossible to the geometrician, while intent upon his argument; it is, upon the same principle, perfectly natural, and even unavoidable, in poetry; because the more a poet attends to his subject, and the better qualified he is to do it justice, the more active will his imagination be, and the more diversified the ideas that present themselves to his mind.——Besides, the true poet addresses himself to the passions and sympathies of mankind; which, till his own be raised, he cannot hope to do with success. And it is the nature of many passions, though not of all, to increase the activity of imagination: and an active imagination naturally vents itself in figurative language; nay, unless restrained by a correct taste, has a tendency to exceed in it; of which Bishop Taylor and Lord Verulam, two geniuses different in kind, but of the highest order, are memorable examples.

We said, that "the poet seeks not to convince the judgment of his reader by arguments of either real or apparent cogency."——We do not mean, that in poetry argument has no place. The most legitimate reasoning, the soundest philosophy, and narratives purely historical, may appear in a poem, and contribute greatly to the honour of the author, and to the importance of his work. All this we have in Paradise Lost. We mean, that what distinguishes *pure* poetry from other writing, is its aptitude, not to sway the judgment by reasoning,

soning, but to please the fancy, and move the passions, by a lively imitation of nature. Nor would we exclude poetical embellishment from history, or even from philosophy. Plato's Dialogues and the Moral Essays of Addison and Johnson abound in poetic imagery; and Livy and Tacitus often amuse their readers with poetical description. In like manner, though geometry and physics be different sciences; though abstract ideas be the subject, and pure demonstration or intuition the evidence, of the former; and though the material universe, and the informations of sense, be the subject and the evidence of the latter; yet have these sciences been united by the best philosophers, and very happy effects resulted from the union.——In one and the same work, poetry, history, philosophy, and oratory, may doubtless be blended; nay, these arts have all been actually blended in one and the same work, not by Milton only, but also by Homer, Virgil, Lucan, and Shakespeare. Yet still these arts are different; different in their ends and principles, and in the faculties of the mind to which they are respectively addressed: and it is easy to perceive when a writer employs one and when another.

§ 2. *Of the Sound of Poetical Language.*

As the ear, like every other perceptive faculty, is capable of gratification, regard is to be had to the sound
66 The poet ought to attend to the harmony of language, which consists in
of words, even in prose. But to the harmony of language, it behoves the poet, more than any other writer, to attend; as it is more especially his concern to render his work pleasurable. In fact, we find, that no poet was ever popular who did not possess the art of harmonious composition.

What belongs to the subject of Poetical Harmony may be referred to one or other of these heads, *Sweetness*, *Measure*, and *Imitation*.

67 sweetness and
I. In order to give *sweetness* to language, either in verse or prose, all words of harsh sound, difficult pronunciation, or unwieldy magnitude, are to be avoided as much as possible, unless when they have in the sound something peculiarly emphatical; and words are to be so placed in respect of one another, as that discordant combinations may not result from their union. But in poetry this is more necessary than in prose; poetical language being understood to be an imitation of natural language improved to that perfection which is consistent with probability. To poetry, therefore, a greater latitude must be allowed than to prose, in expressing, by tropes and figures of pleasing sound, those ideas whereof the proper names are in any respect offensive, either to the ear or to the fancy.

II. How far versification or *regular measure* may be essential to this art, has been disputed by critical writers; some holding it to be indispensably necessary, and some not necessary at all.

68 measure, which, though not essential,
The fact seems to be, as already hinted, that to poetry verse is not essential. In a prose work, we may have the fable, the arrangement, and a great deal of the pathos and language, of poetry; and such a work is certainly a poem, though perhaps not a perfect one. For how absurd would it be to say, that by changing the position only of a word or two in each line, one might divest Homer's Iliad of the poetical character! At this rate, the arts of poetry and versification would be the same; and the rules in Despauter's Grammar, and the moral distichs ascribed to Cato, would be as real poetry as any part of Virgil. In fact, some very ancient poems, when translated into a modern tongue, are far less poetical in verse than in prose; the alterations necessary to adapt them to our numbers being detrimental to their sublime simplicity; of which any person of taste will be sensible, who compares our common prose-version of Job, the Psalms, and the Song of Solomon, with the best metrical paraphrase of those books that has yet appeared. Nay, in many cases, Comedy will be more poetical, because more pleasing and natural, in prose than in verse. By versifying Tom Jones, and The Merry Wives of Windsor, we should spoil the two finest comic poems, the one epic, the other dramatical, now in the world.

But, secondly, though verse be not essential to poetry, 69 adds to the perfection of poetry.
it is necessary to the perfection of all poetry that admits of it. Verse is to poetry, what colours are to painting (G). A painter might display great genius, and draw masterly figures with chalk or ink; but if he intend a perfect picture, he must employ in his work as many colours as are seen in the object he imitates. Or, to adopt a beautiful comparison of Demosthenes, quoted by Aristotle *, "Versification is to poetry what bloom is to the human countenance." A good face is agreeable when the bloom is gone, and good poetry may please without versification; harmonious numbers may set off an indifferent poem, and a fine bloom indifferent features: but, without verse, poetry is incomplete; and beauty is not perfect, unless to sweetness and regularity of feature there be superadded

* Rhetor. lib. iii. cap. 4.

The bloom of young desire, and purple light of love.

If numbers be necessary to the perfection of the higher poetry, they are no less so to that of the lower kinds, to Pastoral, Song, and Satire, which have little besides the language and versification to distinguish them from prose; and which some ancient authors are unwilling to admit to the rank of poems: though it seems too nice a scruple, both because such writings are commonly termed *poetical*; and also because there is, even in them, something that may not improperly be considered as an imitation of nature.

That the rhythm and measure of verse are naturally agreeable, and therefore that by these poetry may be made more pleasing than it would be without them, is evident from this, that children and illiterate people, whose admiration we cannot suppose to be the effect of habit or prejudice, are exceedingly delighted with them. In many proverbial sayings, where there is neither rhime nor alliteration, rhythm is obviously studied. Nay, the use of rhythm in poetry is universal; whereas alliteration and

(G) Horace seems to hint at the same comparison, when, after specifying the several sorts of verse suitable to Epic, Elegiac, Lyric, and Dramatic Poetry, he adds,

Descriptas servare vices, *operumque colores*.
Cur ego, si nequeo, ignoroque, Poeta salutor? *Ar. Poet.* ver. 86.

Of Poetical Harmony.

and rhime, though relished by some nations, are not much sought after by others. And we need not be at a loss to account for the agreeableness of proportion and order, if we reflect, that they suggest the agreeable ideas of contrivance and skill, at the same time that they render the connection of things obvious to the understanding, and imprint it deeply on the memory. Verse, by promoting distinct and easy remembrance, conveys ideas to the mind with energy, and enlivens every emotion the poet intends to raise in the reader or hearer. Besides, when we attend to verses, after hearing one or two, we become acquainted with the measure, which, therefore, we always look for in the sequel. This perpetual interchange of hope and gratification is a source of delight; and to this in part is owing the pleasure we take in the rhimes of modern poetry. And hence we see, that though an incorrect rhime or untuneable verse be in itself, and compared with an important sentiment, a very trifling matter; yet it is no trifle in regard to its effects on the hearer; because it brings disappointment, and so gives a temporary shock to the mind, and interrupts the current of the affections; and because it suggests the disagreeable ideas of negligence or want of skill on the part of the author. And therefore, as the public ear becomes more delicate, the negligence will be more glaring, and the disappointment more intensely felt; and correctness of rhime and of measure will of course be the more indispensible. In our tongue, rhime is more necessary to Lyric than to Heroic poetry. The reason seems to be, that in the latter the ear can of itself perceive the boundary of the measure, because the lines are all of equal length nearly, and every good reader makes a short pause at the end of each; whereas, in the former, the lines vary in length; and therefore the rhime is requisite to make the measure and rhythm sufficiently perceptible. Custom too may have some influence. English Odes without rhime are uncommon; and therefore have something awkward about them, or something at least to which the public ear is not yet thoroughly reconciled. Indeed, when the drama is excepted, we do not think that rhime can be safely spared from English poetry of any kind, but when the subject is able to support itself. "He that thinks himself capable of astonishing (says Johnson) may write blank verse; but those that hope only to please, must condescend to rhime."

70
In what cases rhime may be dispensed with in English poetry.

Rhime, however, is of less importance by far than rhythm, which in poetry as well as in music is the source of much pleasing variety; of variety tempered with uniformity, and regulated by art; insomuch that, notwithstanding the likeness of one hexameter verse to another, it is not common, either in Virgil or Homer, to meet with two contiguous hexameters whose rhythm is exactly the same. And though all English heroic verses consist of five feet, among which the iambic predominates; yet this measure, in respect of rhythm alone, is susceptible of more than 30 varieties. And let it be remarked further, that different kinds of verse, by being adapted to different subjects and modes of writing, give variety to the poetic language, and multiply the charms of this pleasing art.

What has formerly been shown to be true in regard to style, will also in many cases hold true of versification, "that it is then *natural* when it is adapted to the *supposed condition* of the speaker."—In the epopee the poet assumes the character of calm inspiration; and therefore his language must be elevated, and his numbers majestic and uniform. A peasant speaking in heroic or hexameter verse is no improbability here; because his words are supposed to be transmitted by one who will of his own accord give them every ornament necessary to reduce them into dignified measure; as an eloquent man, in a solemn assembly, recapitulating the speech of a clown, would naturally express it in pure and perspicuous language. The uniform heroic measure will suit any subject of dignity, whether narrative or didactic, that admits or requires uniformity of style.

71
The language of the epic poet must be elevated and his numbers uniformly majestic.

In tragedy, where the imitation of real life is more perfect than in epic poetry, the uniform magnificence of epic numbers might be improper; because the heroes and heroines are supposed to speak in their own persons, and according to the immediate impulse of passion and sentiment. Yet, even in tragedy, the versification may be both harmonious and dignified; because the characters are taken chiefly from high life, and the events from a remote period; and because the higher poetry is permitted to imitate nature, not as it is, but in that state of perfection in which it might be. The Greeks and Romans considered their hexameter as too artificial for dramatic poetry; and therefore in tragedy, and even in comedy, made use of the iambic, and some other measures that came near the cadence of conversation: we use the iambic both in the epic and dramatic poem; but for the most part it is, or ought to be, much more elaborate in the former than in the latter. In dramatic comedy, where the manners and concerns of familiar life are exhibited, verse would seem to be unnatural, except it be so like the source of common discourse as to be hardly distinguishable from it. Custom, however, may in some countries determine otherwise; and against custom, in these matters, it is vain to argue. The professed enthusiasm of the dithyrambic poet renders wildness, variety, and a sonorous harmony of numbers, peculiarly suitable to his odes. The love-sonnet, and Anacreontic song, will be less various, more regular, and of a softer harmony; because the state of mind expressed in it has more composure. Philosophy can scarce go further in this investigation, without deviating into whim and hypothesis. The particular sorts of verse to be adopted in the lower species of poetry, are determined by fashion chiefly, and the practice of approved authors.

72
In tragedy the same uniform magnificence would be improper, and much more so in comedy.

III. The origin and principles of *imitative harmony*, or of that artifice by which the sound is made, as Pope says, "an echo to the sense," may be explained in the following manner.

It is pleasing to observe the uniformity of nature in all her operations. Between moral and material beauty and harmony, between moral and material deformity and dissonance, there obtains a very striking analogy. The visible and audible expressions of almost every virtuous emotion are agreeable to the eye and the ear, and those of almost every criminal passion disagreeable. The looks, the attitudes, and the vocal sounds, natural to benevolence, to gratitude, to compassion, to piety, are in themselves graceful and pleasing; while anger, discontent, despair, and cruelty, bring discord to the voice, deformity to the features, and distortion to the limbs. That flowing curve, which painters know to be essential to the beauty of animal shape, gives place to a multiplicity

73
A striking analogy between moral and material beauty and deformity.

Of Poetical Harmony.

tiplicity of right lines and ſharp angles in the countenance and geſture of him who knits his brows, ſtretches his noſtrils, grinds his teeth, and clenches his fiſt; whereas, devotion, magnanimity, benevolence, contentment, and good-humour, ſoften the attitude, and give a more graceful ſwell to the outline of every feature. Certain vocal tones accompany certain mental emotions. The voice of ſorrow is feeble and broken, that of deſpair boiſterous and incoherent; joy aſſumes a ſweet and ſprightly note, fear a weak and tremulous cadence; the tones of love and benevolence are muſical and uniform, thoſe of rage loud and diſſonant; the voice of the ſedate reaſoner is equable and grave, but not unpleaſant; and he who declaims with energy, employs many varieties of modulation ſuited to the various emotions that predominate in his diſcourſe.

But it is not in the language of paſſion only that the human voice varies its tone, or the human face its features. Every ſtriking ſentiment, and every intereſting idea, has an effect upon it. One would eſteem that perſon no adept in narrative eloquence, who ſhould deſcribe, with the very ſame accent, ſwift and ſlow emotion, extreme labour and eaſy performance, agreeable ſenſation and excruciating pain: who ſhould talk of the tumult of a tempeſtuous ocean, the roar of thunder, the devaſtations of an earthquake, or an Egyptian pyramid tumbling into ruins, in the ſame tone of voice wherewith he deſcribes the murmur of a rill, the warbling of the harp of Æolus, the ſwinging of a cradle, or the deſcent of an angel. Elevation of mind gives dignity to the voice. From Achilles, Sarpedon, and Othello, we ſhould as naturally expect a manly and ſonorous accent, as a nervous ſtyle and majeſtic attitude. Coxcombs and bullies, while they aſſume airs of importance and valour, affect alſo a dignified articulation.

74 The ſource of imitative harmony of numbers.

Since the tones of natural language are ſo various, poetry, which imitates the language of nature, muſt alſo vary its tones; and, in reſpect of ſound as well as of meaning, be framed after that model of ideal perfection, which the variety and energy of the human articulate voice render probable. This is the more eaſily accompliſhed, becauſe in every language there is between the ſound and ſenſe of certain words a perceptible analogy; which, though not ſo accurate as to lead a foreigner from the ſound to the ſignification, is yet accurate enough to ſhow, that, in forming ſuch words, regard has been had to the imitative qualities of vocal ſound. Such, in Engliſh, are the words *yell*, *craſh*, *crack*, *hiſs*, *roar*, *murmur*, and many others.

All the particular laws that regulate this ſort of imitation, as far as they are founded in nature, and liable to the cognizance of philoſophy, depend on the general law of ſtyle above mentioned. Together with the other circumſtances of the ſuppoſed ſpeaker, the poet takes into conſideration the tone of voice ſuitable to the ideas that occupy his mind, and thereto adapts the ſound of his language, if it can be done conſiſtently with eaſe and elegance of expreſſion. But when this imitative harmony is too much ſought after, or words appear to be choſen for ſound rather than ſenſe, the verſe becomes finical and ridiculous. Such is Ronſard's affected imitation of the ſong of the ſky-lark:

> Elle quindée du zephire
> Sublime en l'air vire et revire,
> Et y declique un joli cris,
> Qui rit, guérit, et tire l'ire
> Des eſprit mieux que je n'écris.

This is as ridiculous as that line of Ennius,

> Tum tuba terribili ſonitu taratantara dixit:

Or as the following verſes of Swift;

> The man with the kettle-drum enters the gate,
> Dub dub a dub dub: the trumpeters follow,
> Tantara tantara; while all the boys hollow.

75 What harmony of numbers can imitate.

Words by their ſound may imitate ſound; and quick or ſlow articulation may imitate quick or ſlow motion. Hence, by a proper choice and arrangement of words, the poet may imitate *Sounds* that are ſweet with dignity (H),—ſweet and tender (I),—loud (K),—and harſh (L),—and *Motions* that are ſlow, in conſequence of dignity (M),—ſlow in conſequence of difficulty (N), ſwift

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(H) No ſooner had th' Almighty ceas'd, than all
The multitude of angels, with a ſhout
Loud as from numbers without number, ſweet
As from bleſt voices uttering joy; heav'n rung
With jubilee, and loud hoſannas fill'd
Th' eternal regions.—— *Par. Loſt*, iii.

See alſo the night-ſtorm of thunder, lightning, wind, and rain, in Virg. Georg. lib. i. ver. 328—334.

(I) Et longum, formoſe, vale, vale, inquit, Iola.
Virg. Ecl. i.

Formoſam reſonare doces Amaryllida ſilvas.
Virg. Ecl. i.

See alſo the ſimile of the nightingale, Georg. lib. iv. verſ. 511. And ſee that wonderful couplet deſcribing the wailings of the owl, Æneid iv. 462.

(K)————vibratus ab æthere fulgor
Cum ſonitu venit, et ruere omnia viſa repente,
Tyrrhenuſque tubæ mugire per æthera clangor,
Suſpiciunt: iterum atque iterum fragor increpat ingens. *Æneid*, viii.

See alſo the ſtorm in the firſt book of the Æneid, and in the fifth of the Odyſſey.

(L) The hoarſe rough verſe ſhould like the torrent roar. *Pope.*

————On a ſudden open fly,
With impetuous recoil and jarring ſound,
Th' infernal doors, and on their hinges grate
Harſh thunder.—— *Par. Loſt*, ii. 879.

See alſo Homer's Iliad, lib. ii. ver. 363, and Clarke's Annotation.

(M) See an exquiſite example in Gray's Progreſs of Poeſy; the concluſion of the third ſtanza.

(N) And when up ten ſteep ſlopes you've dragg'd your thighs. *Pope.*

Juſt brought out this, when ſcarce his tongue could ſtir. *Pope.*

————The huge leviathan
Wallowing unwieldly, enormous in their gait,
Tempeſt the ocean. *Par. Loſt*, vii. 411.

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ſwift and noiſy (O)—ſwift and ſmooth (P)—uneven and abrupt (Q),—quick and joyous (R). An unexpected pauſe in the verſe may alſo imitate a ſudden failure of ſtrength (S), or interruption of motion (T), or give vivacity to an image or thought, by fixing our attention longer than uſual upon the word that precedes it (U).—Moreover, when we deſcribe great bulk, it is natural for us to articulate ſlowly, even in common diſcourſe; and therefore a line of poetry that requires a ſlow pronunciation, or ſeems longer than it ſhould be, may be uſed with good effect in deſcribing vaſtneſs of ſize (X).—Sweet and ſmooth numbers are moſt proper, when the poet paints agreeable objects, or gentle energy (Y); and harſher ſounds when he ſpeaks of what is ugly, violent, or diſagreeable (Z). This too is according to the nature of common language; for we generally employ harſher tones of voice to expreſs what we diſlike, and more melodious notes to deſcribe the objects of love, complacency, or admiration. Harſh numbers, however, ſhould not be frequent in poetry: for in this art, as in muſic, concord and melody ought always to predominate. And we find in fact, that good poets can occaſionally expreſs themſelves ſomewhat harſhly, when the ſubject requires it, and yet preſerve the ſweetneſs and majeſty of poetical diction. Further, the voice of complaint, pity, love, and all the gentler affections, is mild and muſical, and ſhould therefore be imitated in muſical numbers; while deſpair, defiance, revenge, and turbulent emotions in general, aſſume an abrupt and ſonorous cadence. Dignity of deſcription (A), ſolemn vows (B), and all ſentiments that proceed from a mind elevated with great ideas (C), require a correſpondent

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See the famous deſcription of Siſyphus rolling the ſtone, Odyſſ. lib. xi. ver. 592. See Quintil. Inſt. Orat. lib. ix. cap. 4. § 4. compared with Paradiſe Loſt, book ii. ver. 1022.

(O) Quadrupedante putrem ſonitu quatit ungula
campum. *Æneid.*

Αυταρ επειτα πεδονδε κυλινδετο λαας αναιδης. *Odyſſ.* xi.

See alſo Virg. Æneid. lib. i. ver. 83—87.

(P) See wild as the winds o'er the deſert he flies.
Pope.

Ille volat, ſimul arva fuga, ſimul æquora verrens.
Virg.

Ρηιδιη τ' επειτα πελει, χαλεπη περ εουσα. *Heſiod.*

(Q) Πολλα δ' αναντα καταντα παραντα τε δοχμια τ' ηλθον.
Hom.

The laſs ſhriek'd, ſtarted up, and ſhriek'd again.
Anonym.

(R) Let the merry bells ring round,
And the jocund rebecks ſound,
To many a youth, and many a maid,
Dancing in the checquer'd ſhade. *Milt. Allegro.*

See alſo Gray's Progreſs of Poeſy, ſtanza 3.

(S) Ac velut in ſomnis oculos ubi languida preſſit
Nocte quies, nequicquam avidos extendere curſus
Velle videmur:—et in mediis conatibus ægri
Succidimus.— *Æneid.*

See alſo Virg. Georg. lib. iii. ver. 515, 516.

(T) For this, be ſure to-night thou ſhalt have cramps,
Side-ſtitches that ſhall pen thy breath up. Urchins
Shall exerciſe upon thee.——
Proſpero to Calyban in *the Tempeſt.*

See Pope's Iliad, xiii. 199.

(U) ———How often from the ſteep
Of echoing hill or thicket have we heard
Celeſtial voices, to the midnight air,
Sole,—or reſponſive to each other's note,
Singing their great Creator?——*Par. Loſt*, iv.

And over them triumphant Death his dart
Shook,——but delay'd to ſtrike. *Id.*

See alſo Hom. Odyſſ. lib. ix. ver. 290.

(X) Thus ſtretch'd out, huge in length, the arch fiend
lay. *Par. Loſt.*

Monſtrum horrendum, informe, ingens, cui lumen
ademptum. *Æneid.* iii.

Et magnos membrorum artus, magna oſſa, lacertoſque
Exuit, atque ingens media conſiſtit arena.
Æneid. v. 422.

(Y) Hic gelidi fontes, hic mollia prata, Lycori,
Hic nemus, hic ipſo tecum conſumerer ævo.
Virg. Ecl. x.

The dumb ſhall ſing; the lame his crutch forego,
And leap, exulting, like the bounding roe.
Pope's Meſſiah.

See Milton's deſcription of the evening, Par. Loſt, book iv. ver. 598—609.

Ye gentle gales beneath my body blow,
And ſoftly lay me on the waves below.
Pope's Sappho.

(Z) Stridenti ſtipula miſerum diſperdere carmen.
Virg. Ecl. iii.

Immo ego Sardois videar tibi amarior herbis,
Horridior ruſco, projecta vilior alga.
Virg. Ecl. vii.

Neu patriæ validas in viſcera vertite vires.
Virg. Æneid. vi.

See alſo Milton's deſcription of the Lazar-houſe in Paradiſe Loſt, book xi. ver. 477—492.

(A) See Virg. Georg. l. 328. and Homer, Virgil, and Milton, *paſſim.* See alſo Dryden's Alexander's Feaſt, and Gray's Odes.

(B) See Virg. Æneid, iv. 24.

(C) Examples are frequent in the great authors. See Othello's exclamation:

————O now for ever
Farewell the tranquil mind! &c. *Act* iii. *ſc.* 3.

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correspondent pomp of language and versification.—Lastly, an irregular or uncommon movement in the verse may sometimes be of use, to make the reader conceive an image in a particular manner. Virgil, describing horses running over rocky heights at full speed, begins the line with two dactyls, to imitate rapidity, and concludes it with eight long syllables:

> Saxa per, et scopulos, et depressas convalles,
> *Georg.* iii. 276.

which is very unusual measure, but seems well adapted to the thing expressed, namely, to the descent of the animal from the hills to the low ground. At any rate, this extraordinary change of the rhythm may be allowed to bear some resemblance to the animal's change of motion, as it would be felt by a rider, and as we may suppose it is felt by the animal itself.

Other forms of imitative harmony, and many other examples, besides those referred to in the margin, will readily occur to all who are conversant in the writings of the best versifiers, particularly Homer, Virgil, Milton, Lucretius, Spenser, Dryden, Shakespeare, Pope, and Gray.

Part II. Of the DIFFERENT SPECIES of POETRY, with their Particular Principles.

Sect. I. *Of Epic and Dramatic Compositions.*

§ 1. *The Epopee and Drama compared.*

Elem. of Criticism.

76 In what tragic and epic poetry agree, and in what they differ.

TRAGEDY and the epic differ not in substantials: in both the same ends are proposed, viz. instruction and amusement; and in both the same mean is employed, viz. imitation of human actions. They differ only in the manner of imitating; epic poetry employs narration; tragedy represents its facts as passing in our sight: in the former, the poet introduces himself as an historian; in the latter, he presents his actors, and never himself.

This difference, regarding form only, may be thought slight: but the effects it occasions are by no means so; for what we see makes a deeper impression than what we learn from others. A narrative poem is a story told by another: facts and incidents passing upon the stage, come under our own observation; and are beside much enlivened by action and gesture, expressive of many sentiments beyond the reach of language.

A dramatic composition has another property, independent altogether of action; which is, that it makes a deeper impression than narration: in the former, persons express their own sentiments; in the latter, sentiments are related at second-hand. For that reason, Aristotle, the father of critics, lays it down as a rule *, That in an epic poem the author ought to have every opportunity of introducing his actors, and of confining the narrative part within the narrowest bounds. Homer understood perfectly the advantage of this method; and his poems are both of them in a great measure dramatic. Lucan runs to the opposite extreme; and is guilty of a still greater fault, in stuffing his *Pharsalia* with cold and languid reflections, the merit of which he assumes to himself, and deigns not to share with his actors. Nothing can be more injudiciously timed, than a chain of such reflections, which suspend the battle of Pharsalia, after the leaders had made their speeches, and the two armies are ready to engage †.

* *Poet.* chap. 25. sect. 6.

† *Lib.* vii. from line 385 to line 460.

77 Tragic and epic poetry pathetic or moral.

Aristotle, from the nature of the fable, divides tragedy into simple and complex: but it is of greater moment, with respect to dramatic as well as epic poetry, to found a distinction upon the different ends attained by such compositions. A poem, whether dramatic or epic, that has nothing in view but to move the passions and to exhibit pictures of virtue and vice, may be distinguished by the name of *pathetic*: but where a story is purposely contrived to illustrate some moral truth, by showing that disorderly passions naturally lead to external misfortunes, such compositions may be denominated *moral*. Beside making a deeper impression than can be done by cool reasoning, a moral poem does not fall short of reasoning in affording conviction: the natural connection of vice with misery, and of virtue with happiness, may be illustrated by stating a fact as well as by urging an argument. Let us assume, for example, the following moral truths: That discord among the chiefs renders ineffectual all common measures; and that the consequences of a slightly founded quarrel, fostered by pride and arrogance, are not less fatal than those of the grossest injury: these truths may be inculcated by the quarrel between Agamemnon and Achilles at the siege of Troy. If facts or circumstances be wanting, such as tend to rouse the turbulent passions, they must be invented; but no accidental nor unaccountable event ought to be admitted; for the necessary or probable connection between vice and misery is not learned from any events but what are naturally occasioned by the characters and passions of the persons represented, acting in such circumstances. A real event, of which we see not the cause, may afford a lesson, upon the presumption that what hath happened may again happen: but this cannot be inferred from a story that is known to be a fiction.

78 The good effects of such compositions.

Many are the good effects of such compositions. A pathetic composition, whether epic or dramatic, tends to a habit of virtue, by exciting us to do what is right, and restraining us from what is wrong. Its frequent pictures of human woes produce, beside, two effects, extremely salutary: They improve our sympathy, and fortify us to bear our misfortunes. A moral composition must obviously produce the same good effects because by being moral it ceaseth not to be pathetic: it enjoys besides an excellence peculiar to itself; for it not only improves the heart, as above mentioned, but instructs the head by the moral it contains. It seems impossible to imagine any entertainment more suited to a rational being, than a work thus happily illustrating some moral truth; where a number of persons of different characters are engaged in an important action, some retarding, others promoting, the great catastrophe; and where there is dignity of style as well as of matter. A work of this kind has our sympathy at command,

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mand, and can put in motion the whole train of the social affections: our curiosity in some scenes is excited, in others gratified; and our delight is consummated at the close, upon finding, from the characters and situations exhibited at the commencement, that every incident down to the final catastrophe is natural, and that the whole in conjunction make a regular chain of causes and effects.

Considering that an epic and a dramatic poem are the same in substance, and have the same aim or end, one will readily imagine, that subjects proper for the one must be equally proper for the other. But considering their difference as to form, there will be found reason to correct that conjecture, at least in some degree.

79 The same subjects not always fit for tragic and epic poetry.

Many subjects may indeed be treated with equal advantage in either form: but the subjects are still more numerous for which they are not equally qualified; and there are subjects proper for the one and not at all for the other. To give some slight notion of the difference, as there is no room here for enlarging upon every article, we observe, that dialogue is better qualified for expressing sentiments, and narrative for displaying facts. Heroism, magnanimity, undaunted courage, and other elevated virtues, figure best in action: tender passions, and the whole tribe of sympathetic affections, figure best in sentiment. It clearly follows, that tender passions are more peculiarly the province of tragedy, grand and heroic actions of epic poetry.

"The epic poem is universally allowed to be *, of all poetical works, the most dignified, and, at the same time, the most difficult in execution. To contrive a story which shall please and interest all readers, by being at once entertaining, important, and instructive; to fill it with suitable incidents; to enliven it with a variety of characters and of descriptions; and, throughout a long work, to maintain that propriety of sentiment, and that elevation of style, which the epic character requires, is unquestionably the highest effort of poetical genius.

* *Blair's Lectures.*

80 The proper subject of an epic poem.

"The action or subject of the epic poem must be great and interesting. Without greatness it would not have sufficient importance either to fix our attention or to justify the magnificent apparatus which the poet bestows on it. This is so evidently requisite as not to require illustration; and, indeed, hardly any who have attempted epic poetry have failed in choosing some subject sufficiently important, either by the nature of the action or by the fame of the personages concerned in it. The fame of Homer's heroes, and the consequences of dissension between the greatest of them, is a subject important in itself, and must have appeared particularly so to his countrymen, who boasted their descent from those heroes. The subject of the Æneid is still greater than that of the Iliad, as it is the foundation of the most powerful empire that ever was established upon this globe; an event of much greater importance than the destruction of a city, or the anger of a semibarbarous warrior. But the poems of Homer and Virgil fall in this respect infinitely short of that of Milton. 'Before the greatness displayed in Paradise Lost, it has been well observed † that all other greatness shrinks away. The subject of the English poet is not the destruction of a city, the conduct of a colony, or the foundation of an empire: it is the fate of worlds, the revolutions of heaven and earth; rebellion against the Supreme King, raised by the highest order of created beings; the overthrow of their host and the punishment of their crime; the creation of a new race of reasonable creatures; their original happiness and innocence, their forfeiture of immortality, and their restoration to hope and peace."

† *Johnson's Life of Milton.*

An epic poem, however, is defective if its action be not interesting as well as great; for a narrative of mere valour may be so constructed as to prove cold and tiresome. "Much * will depend on the happy choice of some subject, which shall by its nature interest the public; as when the poet selects for his hero one who is the founder, or the deliverer, or the favourite of his nation; or when he writes atchievements that have been highly celebrated, or have been connected with important consequences to any public cause. Most of the great epic poems are abundantly fortunate in this respect, and must have been very interesting to those ages in which they were composed." The subject of the Paradise Lost, as it is infinitely greater, must likewise be considered as more universally interesting than that of any other poem. "We all feel the effects of Adam's transgression; we all sin like him, and like him must all bewail our offences. We have restless and insidious enemies in the fallen angels, and in the blessed spirits we have guardians and friends; in the redemption of mankind we hope to be included; in the description of heaven and hell we are surely interested, as we are all to reside hereafter either in the regions of horror or bliss."

* *Blair ubi supra.*

81 Circumstances chiefly interesting in epic poetry.

"The chief circumstance which renders an epic poem interesting †, and which tends to interest not one age or country alone, but all readers, is the skilful conduct of the author in the management of his subject. His plan must comprehend many affecting incidents. He may sometimes be awful and august; he must often be tender and pathetic; he must give us gentle and pleasing scenes of love, friendship, and affection. The more that an epic poem abounds with situations which awaken the feelings of humanity, it is the more interesting. In this respect perhaps no epic poets have been so happy as Virgil and Tasso. The plan of the *Paradise Lost* comprises neither human actions nor human manners. The man and woman who act and suffer, are in a state which no other man or woman can ever know. The reader finds no transaction in which he can be engaged; beholds no condition in which he can by any effort of imagination place himself; he has therefore little natural curiosity or sympathy."

† *Blair and Johnson.*

82 Whether the hero must necessarily be successful.

A question has been moved, Whether the nature of the epic poem does not require that the hero should be ultimately successful? To this question Johnson replies, that "there is no reason why the hero should not be unfortunate, except established practice, since success and virtue do not necessarily go together." Most critics, however, are of a different opinion, and hold success to be, if not the necessary, at least the most proper issue of an epic poem. An unhappy conclusion depresses the mind, and is opposite to the elevating emotions which belong to this species of poetry. Terror and compassion are the proper subjects of tragedy; but as the epic is of larger extent, it were too much, if, after the difficulties and troubles which commonly abound in the progress of the poem, the author should bring them all at last to an unfortunate conclusion. We know not that any author of name has held this course except *Lucan*; for in the *Paradise Lost*, as Adam's deceiver is at last crushed, and he himself restored to the favour of his maker, Milton's hero must be considered as finally successful.

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We have no occasion to say more of the epic, considered as peculiarly adapted to certain subjects, and to be conducted according to a certain plan. But as dramatic subjects are more complex, it is necessary to take a narrower view of them. They are either the light and the gay, or the grave and affecting, incidents of human life. The former constitute the subject of comedy, and the latter of tragedy.

As great and serious objects command more attention than little and ludicrous ones; as the fall of a hero interests the public more than the marriage of a private person; tragedy has been always held a more dignified entertainment than comedy. The first thing required of the tragic poet is, that he pitch upon some moving and interesting story, and that he conduct it in a natural and probable manner. For we must observe, that the natural and probable are more essential to tragic than even to epic poetry. Admiration is excited by the wonderful; but passion can be raised only by the impressions of nature and truth upon the mind.

84 Subjects best suited to tragedy.

The subject best fitted for tragedy is where a man has himself been the cause of his misfortune; not so as to be deeply guilty, nor altogether innocent: the misfortune must be occasioned by a fault incident to human nature, and therefore in some degree venial. Such misfortunes call forth the social affections, and warmly interest the spectator. An accidental misfortune, if not extremely singular, doth not greatly move our pity: the person who suffers, being innocent, is freed from the greatest of all torments, that anguish of mind which is occasioned by remorse. An atrocious criminal, on the other hand, who brings misfortunes upon himself, excites little pity, for a different reason: his remorse, it is true, aggravates his distress and swells the first emotions of pity: but then our hatred of him as a criminal blending with pity, blunts its edge considerably. Misfortunes that are not innocent, nor highly criminal, partake the advantages of each extreme: they are attended with remorse to embitter the distress, which raises our pity to a great height; and the slight indignation we have at a venial fault detracts not sensibly from our pity. The happiest of all subjects accordingly for raising pity, is where a man of integrity falls into a great misfortune by doing an action that is innocent, but which, by some singular means, is conceived by him to be criminal: his remorse aggravates his distress; and our compassion, unrestrained by indignation, knows no bounds. Pity comes thus to be the ruling passion of a pathetic tragedy; and, by proper representation, may be raised to a height scarcely exceeded by any thing felt in real life. A moral tragedy takes in a larger field; as it not only exercises our pity, but raises another passion, which, though selfish, deserves to be cherished equally with the social affection. The passion we have in view is fear or terror; for when a misfortune is the natural consequence of some wrong bias in the temper, every spectator who is conscious of such a bias in himself takes the alarm, and dreads his falling into the same misfortune: and by the emotion of fear or terror, frequently reiterated in a variety of moral tragedies, the spectators are put upon their guard against the disorders of passion.

The commentators upon Aristotle, and other critics, have been much gravelled about the account given of tragedy by that author: "That by means of pity and terror, it refines or purifies in us all sorts of passion." But no one who has a clear conception of the end and effects of a good tragedy, can have any difficulty about Aristotle's meaning: Our pity is engaged for the persons represented; and our terror is upon our own account. Pity indeed is here made to stand for all the sympathetic emotions, because of these it is the capital. There can be no doubt, that our sympathetic emotions are refined or improved by daily exercise; and in what manner our other passions are refined by terror, has been just now said. One thing is certain, that no other meaning can justly be given to the foregoing doctrine than that now mentioned; and that it was really Aristotle's meaning, appears from his 13th chapter, where he delivers several propositions conformable to the doctrines as here explained. These, at the same time, we take liberty to mention; because, so far as authority can go, they confirm the foregoing reasoning about subjects proper for tragedy. The first proposition is, That it being the province of tragedy to excite pity and terror, an innocent person falling into adversity ought never to be the subject. This proposition is a necessary consequence of his doctrine as explained; a subject of that nature may indeed excite pity and terror; but the former in an inferior degree, and the latter in no degree for moral instruction. The second proposition is, That the history of a wicked person in a change from misery to happiness ought not to be represented; which excites neither terror nor compassion, nor is agreeable in any respect. The third is, That the misfortunes of a wicked person ought not to be represented: such representation may be agreeable in some measure upon a principle of justice; but it will not move our pity, or any degree of terror, except in those of the same vicious disposition with the person represented. The last proposition is, That the only character fit for representation lies in the middle, neither eminently good nor eminently bad; where the misfortune is not the effect of deliberate vice, but of some involuntary fault, as our author expresses it. The only objection we find to Aristotle's account of tragedy, is, that he confines it within too narrow bounds, by refusing admittance to the pathetic kind; for if terror be essential to tragedy, no representation deserves that name but the moral kind, where the misfortunes exhibited are caused by a wrong balance of mind, or some disorder in the internal constitution: such misfortunes always suggest moral instruction; and by such misfortunes only can terror be excited for our improvement.

Thus Aristotle's four propositions above mentioned relate solely to tragedies of the moral kind. Those of the pathetic kind are not confined within so narrow limits: subjects fitted for the theatre are not in such plenty as to make us reject innocent misfortunes which rouse our sympathy, though they inculcate no moral. With respect indeed to the subjects of that kind, it may be doubted, whether the conclusion ought not always to be fortunate. Where a person of integrity is represented as suffering to the end under misfortunes purely accidental, we depart discontented, and with some obscure sense of injustice: for seldom is man so submissive to Providence, as not to revolt against the tyranny and vexations of blind chance; he will be tempted to say, this ought not to be. We give for an example the *Romeo and Juliet* of Shakespeare, where the fatal catastrophe is occasioned by Friar Lawrence's coming to the monument a minute too late; we are vexed at the unlucky chance, and go away dissatisfied. Such impres-

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sions, which ought not to be cherished, are a sufficient reason for excluding stories of this kind from the theatre.

85 The impproper use of destiny in the ancient tragedies.

The misfortunes of a virtuous person, arising from necessary causes, or a chain of unavoidable circumstances, as they excite a notion of destiny, are equally unsatisfactory to the human mind. A metaphysician in his closet may reason himself into the belief of fate, or what in modern language is called *philosophical necessity*; but the feelings of the heart revolt against that doctrine; and we have the confession of the two ablest philosophers by whom it was ever maintained, that men conduct themselves through life as if their will were absolutely free, and their actions no part of a chain of necessary causes and effects. As no man goes to the theatre to study metaphysics, or to divest himself of the common feelings of humanity, it is impossible, whatever be his philosophical creed, that he should contemplate without horror and disgust an innocent person suffering by mere destiny. A tragedy of uncommon merit in every other respect may indeed be endured, nay perhaps admired, though such be its catastrophe; because no work of man was ever perfect; and because, where imperfections are unavoidable, a multitude of excellencies may be allowed to cover one fault: but we believe the misery of an innocent person resulting from a chain of unavoidable circumstances has never been considered as a beauty by minds unperverted by a false philosophy. "It must be acknowledged * that the subjects of the ancient Greek tragedies were frequently founded on mere destiny and inevitable misfortunes. In the course of the drama many moral sentiments occurred; but the only instruction which the fable conveyed was, that reverence was due to the gods, and submission to the decrees of fate. Modern tragedy has aimed at a higher object, by becoming more the theatre of passion; pointing out to men the consequences of their own misconduct, showing the direful effects which ambition, jealousy, love, resentment, and other such strong emotions, when misguided or left unrestrained, produce upon human life. An Othello, hurried by jealousy to murder his innocent wife; a Jaffier ensnared by resentment and want to engage in a conspiracy, and then stung with remorse and involved in ruin; a Siffredi, through the deceit which he employs for public-spirited ends, bringing destruction on all whom he loved: these, and such as these, are the examples which Tragedy now displays to public view; and by means of which it inculcates on men the proper government of their passions."

* Blair.

86 How it is used in the tragedy of the Robbers.

There is indeed one singular drama, in which destiny is employed in a manner very different from that in which it was used by the poets of Greece and Rome. It is Schiller's tragedy of the Robbers, of which "the hero endowed by nature (as the translator of the piece observes) with the most generous feelings, animated by the highest sense of honour, and susceptible of the warmest affections of the heart, is driven by the perfidy of a brother, and the supposed inhumanity of his father, into a state of confirmed misanthropy and despair." He wished that he "could blow the trumpet of rebellion through all nature; that he could extinguish with one mortal blow the viperous race of men; and that he could so strike as to destroy the germ of existence." In this situation he is hurried on to the perpetration of a series of crimes which find from their very magnitude and atrocity a recommendation to his distempered mind. Sensible all the while of his own guilt, and suffering for that guilt the severest pangs of remorse, he yet believes himself an instrument of vengeance in the hands of the Almighty for the punishment of the crimes of others. In thus accomplishing the dreadful destiny which is prescribed for him, he feels a species of gloomy satisfaction, at the same time that he considers himself as doomed to the performance of that part in life which is to consign his memory to infamy and his soul to perdition. After burning a town, he exclaims, "O God of vengeance! am I to blame for this? Art thou to blame, O Father of Heaven! when the instruments of thy wrath, the pestilence, flood, and famine overwhelm at once the righteous and the guilty? Who can command the flames to stay their course, to destroy only the noxious vermin, and spare the fertile field?" yet with the same breath he accuses himself of extreme criminality for "presumptuously wielding the sword of the Most High!" He frequently laments in the most affecting manner the loss of his innocence, wishes that "he could return into the womb that bare him, that he hung an infant at the breast, that he were born a beggar, the meanest hind, a peasant of the field." He considers himself as the outcast of Heaven, and finally rejected by the Father of mercy; yet he tells the band of robbers whom he commanded, that the "Almighty honoured them as agents in his hands to execute his wonderous purposes; employed them as his angels to execute his stern decrees, and pour the vials of his wrath;" and in a very solemn prayer, he supposes that "the God who ruleth over all had *decreed* that he should become the chief of these foul murderers."

"It will be allowed (says the translator), that the imagination could not have conceived a spectacle more deeply interesting, more powerfully affecting to the mind of man, than that of a human being thus characterised and acting under such impressions. The compassionate interest which the mind feels in the emotions or sufferings of the guilty person, is not diminished by the observation, that he acts under an impression of inevitable destiny; on the contrary, there is something in our nature which leads us the more to compassionate the instrument of those crimes, that we see him consider himself as bound to guilt by fetters, which he has the constant wish, but not the strength, to break."

This is indeed true: we sympathise with the hero of the Robbers, not only on account of his exalted sentiments and his inflexible regard to the abstract principles of honour and justice, but much more for that disorder of intellect which makes him *suppose* "his destiny fixed and unalterable," at the very time that he is torn with remorse for the perpetration of those crimes by which he believed it to be fulfilling. Destiny, however, is not in this tragedy exhibited as real, but merely as the phantom of a distempered though noble mind. Had the poet represented his hero as in *fact decreed by God*, or *bound by fate*, to head a band of foul murderers, and to commit a series of the most atrocious crimes; though our pity for him might not have been lessened, the impressions of the whole piece on the mind could have been only those of horror and disgust at what would have appeared to us the unequal ways of providence.

The tragedy of the Robbers is a striking instance of the justness of Dr Blair's criticism, in opposition to that of

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87
Whether the ſubject of tragedy ſhould have its foundation in truth.

of Lord Kames. His lordſhip holds that it is eſſential to a good tragedy, that its principal facts be borrowed from hiſtory; becauſe a mixture of known truth with the fable tends to delude us into a conviction of the reality of the whole. The Doctor conſiders this as a matter of no great conſequence; for "it is proved by experience, that a fictitious tale, if properly conducted, will melt the heart as much as any real hiſtory;" this obſervation is verified in the Robbers. It is indeed a very irregular drama, and perhaps could not be acted on a Britiſh theatre. But although the whole is known to be a fiction, we believe there are few effuſions of human genius which more powerfully excite the emotions of terror and pity. Truth is indeed congenial to the mind; and when a ſubject proper for tragedy occurs in hiſtory or tradition, it is perhaps better to adopt it than to invent one which has no ſuch foundation. But in chooſing a ſubject which makes a figure in hiſtory, greater precaution is neceſſary than where the whole is a fiction. In the latter caſe the author is under no reſtraint other than that the characters and incidents be juſt copies of nature. But where the ſtory is founded on truth, no circumſtances muſt be added, but ſuch as connect naturally with what are known to be true; hiſtory may be ſupplied, but muſt not be contradicted. Further, the ſubject choſen muſt be diſtant in time, or at leaſt in place; for the familiarity of recent perſons and events ought to be avoided. Familiarity ought more eſpecially to be avoided in an epic poem, the peculiar character of which is dignity and elevation: modern manners make but a poor figure in ſuch a poem. Their familiarity unqualifies them for a lofty ſubject. The dignity of them will be better underſtood in future ages, when they are no longer familiar.

After Voltaire, no writer, it is probable, will think of rearing an epic poem upon a recent event in the hiſtory of his own country. But an event of that kind is perhaps not altogether unqualified for tragedy: it was admitted in Greece; and Shakeſpeare has employed it ſucceſsfully in ſeveral of his pieces. One advantage it poſſeſſes above fiction, that of more readily engaging our belief, which tends above any other particular to raiſe our ſympathy. The ſcene of comedy is generally laid at home: familiarity is no objection; and we are peculiarly ſenſible of the ridicule of our own manners.

88
How a tragedy ſhould be divided into acts; and how many acts it ſhould have.

Elem. of Criticiſm, ch. xxii.

After a proper ſubject is choſen, the dividing it into parts requires ſome art. The concluſion of a book in an epic poem, or of an act in a play, cannot be altogether arbitrary; nor be intended for ſo ſlight a purpoſe as to make the parts of equal length. The ſuppoſed pauſe at the end of every book, and the real pauſe at the end of every act, ought always to coincide with ſome pauſe in the action. In this reſpect, a dramatic or epic poem ought to reſemble a ſentence or period in language, divided into members that are diſtinguiſhed from each other by proper pauſes; or it ought to reſemble a piece of muſic, having a full cloſe at the end, preceded by imperfect cloſes that contribute to the melody. The diviſion of every play into *five* acts has no other foundation than common practice, and the authority of Horace (D). It is a diviſion purely arbitrary; there is nothing in the nature of the compoſition which fixes this number rather than any other; and it had been much better if no ſuch number had been aſcertained. But, ſince it is aſcertained, every act in a dramatic poem ought to cloſe with ſome incident that makes a pauſe in the action; for otherwiſe there can be no pretext for interrupting the repreſentation. It would be abſurd to break off in the very heat of action; againſt which every one would exclaim: the abſurdity ſtill remains where the action relents, if it be not actually ſuſpended for ſome time. This rule is alſo applicable to an epic poem: though in it a deviation from the rule is leſs remarkable; becauſe it is in the reader's power to hide the abſurdity, by proceeding inſtantly to another book. The firſt book of Paradiſe Loſt ends without any cloſe, perfect or imperfect: it breaks off abruptly, where Satan, ſeated on his throne, is prepared to harangue the convocated hoſt of the fallen angels; and the ſecond book begins with the ſpeech. Milton ſeems to have copied the Æneid, of which the two firſt books are divided much in the ſame manner. Neither is there any proper pauſe at the end of the ſeventh book of Paradiſe Loſt, nor at the end of the eleventh. In the Iliad little attention is given to this rule.

89
The object of comedy.

Beſides tragedy, dramatic poetry comprehends comedy and farce. Theſe are ſufficiently diſtinguiſhed from tragedy by their general ſpirit and ſtrain. "While pity and terror, and the other ſtrong paſſions, form the province of the tragic muſe, the chief or rather ſole inſtrument of comedy and farce is ridicule." Theſe two ſpecies of compoſition are ſo perpetually running into each other, that we ſhall not treat of them ſeparately; ſince what is now known by the name of *farce* differs in nothing eſſential from what was called the *old comedy* among the Greeks. "Comedy propoſes for its object * neither the great ſufferings nor the great crimes of men; but their follies and ſlighter vices, thoſe parts of their character which raiſe in beholders a ſenſe of impropriety, which expoſe them to be cenſured and laughed at by others, or which render them troubleſome in civil ſociety.

* *Blair's Lectures.*

"The ſubjects of tragedy are not limited to any age or country; but the ſcene and ſubject of comedy ſhould always be laid in our own country, and in our own times. The reaſon is obvious: thoſe decorums of behaviour, thoſe leſſer diſcriminations of character, which afford ſubject for comedy, change with the differences of countries and times; and can never be ſo well underſtood by foreigners as by natives. The comic poet, who aims at correcting improprieties and follies of behaviour, ſhould 'catch the manners living as they riſe.'" It is not his buſineſs to amuſe us with a tale of other times; but to give us pictures taken from among ourſelves; to ſatirize

 reigning

(D) *Neve minor, neu ſit quinto productior actu*
Fabula. De Arte Poetica.

If you would have your play deſerve ſucceſs,
Give it five acts complete, nor more nor leſs. Francis.

reigning and present vices; to exhibit to the age a faithful copy of itself, with its humours, its follies, and its extravagancies.

90 Comedy of two kinds. "Comedy may be divided into two kinds: comedy of *character*, and comedy of *intrigue*. The former is the more valuable species; because it is the business of comedy to exhibit the prevailing manners which mark the character of the age in which the scene is laid: yet there should be always as much intrigue as to give us something to wish and something to fear. The incidents should so succeed one another, as to produce striking situations, and to fix our attention; while they afford at the same time a proper field for the exhibition of character. The action in comedy, though it demands the poet's care in order to render it animated and natural, is a less significant and important part of the performance than the action in tragedy: as in comedy it is what men say, and how they behave, that draws our attention, rather than what they perform or what they suffer.

91 The common faults of comedy. "In the management of characters, one of the most common faults of comic writers is the carrying of them too far beyond life. Wherever ridicule is concerned, it is indeed extremely difficult to hit the precise point where true wit ends and buffoonery begins. When the miser in Plautus, searching the person whom he suspects of having stolen his casket, after examining first his right hand and then his left, cries out, *ostende etiam tertiam*—'show me your third hand,' there is no one but must be sensible of the extravagance. Certain degrees of exaggeration are allowed to the comedian, but there are limits set to it by nature and good taste; and supposing the miser to be ever so much engrossed by his jealousy and his suspicions, it is impossible to conceive any man in his wits suspecting another of having more than two hands."

It appears from the plays of Aristophanes which remain, that the characters in the old comedy of Athens were almost always overcharged. They were likewise direct and avowed satires against particular persons, who were brought upon the stage by name. "The ridicule employed in them is extravagant, the wit for the most part buffoonish and farcical, the raillery biting and cruel, and the obscenity that reigns in them is gross and intolerable. They seem to have been composed merely for the mob." Yet of these abominable dramas, an excellent critic* has affirmed, with too much truth, that what is now called *farce* is nothing more than the shadow. The characters in genuine comedy are not those of particular and known persons, but the general characters of the age and nation; which it requires no small skill to distinguish clearly and naturally from each other. In attempting this, poets are too apt to contrast characters and introduce them always in pairs; which gives an affected air to the whole piece. The perfection of art is to conceal art. "A masterly writer will give us his characters distinguished rather by such shades of diversity as are commonly found in society, than marked with such strong oppositions as are rarely brought into actual contrast in any of the circumstances of real life."

* *Hurd.*

92 The style of comedy. The style of comedy ought to be pure, elegant, and lively, very seldom rising higher than the ordinary tone of polite conversation; and upon no occasion descending into vulgar, mean, and gross expressions; and in one word, action and character being the fundamental parts of every epic and dramatic composition, the sentiments and tone of language ought to be subservient to these, so as to appear natural and proper for the occasion.

§ 2. *Respective peculiarities of the Epopee and Drama.*

In a theatrical entertainment, which employs both the eye and the ear, it would be a gross absurdity to introduce upon the stage superior beings in a visible shape. There is no place for such objection in an *epic poem*; and Boileau, with many other critics, declares strongly for that sort of machinery in an epic poem. But waving authority, which is apt to impose upon the judgement, let us draw what light we can from reason. We may in the first place observe, that this matter is but indistinctly handled by critics: the poetical privilege of animating insensible objects for enlivening a description, is very different from what is termed *machinery*, where deities, angels, devils, or other supernatural powers, are introduced as real personages, mixing in the action, and contributing to the catastrophe; and yet these two things are constantly jumbled together in reasoning. The former is founded on a natural principle: but nothing is more unnatural than the latter. Its effects, at the same time, are deplorable. First, it gives an air of fiction to the whole; and prevents that impression of reality which is requisite to interest our affections, and to move our passions; which of itself is sufficient to explode machinery, whatever entertainment it may afford to readers of a fantastic taste or irregular imagination. And, next, were it possible, by disguising the fiction, to delude us into a notion of reality, an insuperable objection would still remain, which is, that the aim or end of an epic poem can never be attained in any perfection where machinery is introduced; for an evident reason, that virtuous emotions cannot be raised successfully but by the actions of those who are endued with passions and affections like our own, that is, by human actions; and as for moral instruction, it is clear, that none can be drawn from beings who act not upon the same principles with us. A fable in Æsop's manner is no objection to this reasoning: his lions, bulls, and goats, are truly men under disguise; they act and feel in every respect as human beings; and the moral we draw is founded on that supposition. Homer, it is true, introduces the gods into his fable: but the religion of his country authorized that liberty; it being an article in the Grecian creed, that the gods often interpose visibly and bodily in human affairs. It must however be observed, that Homer's deities do no honour to his poems: fictions that transgress the bounds of nature, seldom have a good effect; they may inflame the imagination for a moment, but will not be relished by any person of a correct taste. They may be of some use to the lower rank of writers; but an author of genius has much finer materials, of Nature's production, for elevating his subject, and making it interesting.

93 Machinery can have no place in a drama, nor

94 has it a good effect in the higher epic.

One would be apt to think, that Boileau, declaring for the Heathen deities, intended them only for embellishing the diction: but unluckily he banishes angels and devils, who undoubtedly make a figure in poetic language, equal to the Heathen deities. Boileau, therefore, by pleading for the latter in opposition to the former, certainly meant, if he had any distinct meaning, that the Heathen deities may be introduced as actors. And, in fact, he himself is guilty of that glaring absurdity,

Of the Epopee.

where it is not so pardonable as in an epic poem: In his ode upon the taking of Namur, he demands, with a most serious countenance, whether the walls were built by Apollo or Neptune: and in relating the passage of the Rhine, anno 1672, he describes the god of that river as fighting with all his might to oppose the French monarch; which is confounding fiction with reality at a strange rate. The French writers in general run into this error: wonderful the effect of custom entirely to hide from them how ridiculous such fictions are!

That this is a capital error in *Gierusalemme Liberata*, Tasso's greatest admirers must acknowledge: a situation can never be intricate, nor the reader even in pain about the catastrophe, so long as there is an angel, devil, or magician, to lend a helping hand. Voltaire, in his essay upon epic poetry, talking of the *Pharsalia*, observes judiciously, "That the proximity of time, the notoriety of events, the character of the age, enlightened and political, joined with the solidity of Lucan's subject, deprived him of poetical fiction." Is it not amazing, that a critic who reasons so justly with respect to others, can be so blind with respect to himself? Voltaire, not satisfied to enrich his language with images drawn from invisible and superior beings, introduces them into the action: in the sixth canto of the *Henriade*, St Louis appears in person, and terrifies the soldiers; in the seventh canto, St Louis sends the god of Sleep to Henry; and in the tenth, the Demons of Discord, Fanaticism, War, &c. assist Aumale in a single combat with Turenne, and are driven away by a good angel brandishing the sword of God. To blend such fictitious personages in the same action with mortals, makes a bad figure at any rate; and is intolerable in a history so recent as that of Henry IV. But perfection is not the lot of man.

But perhaps the most successful weapon that can be employed upon this subject is ridicule. Addison has applied this in an elegant manner: "Whereas the time of a general peace is, in all appearance, drawing near; being informed that there are several ingenious persons who intend to show their talents on so happy an occasion, and being willing, as much as in me lies, to prevent that effusion of nonsense which we have good cause to apprehend; I do hereby strictly require every person who shall write on this subject, to remember that he is a Christian, and not to sacrifice his catechism to his poetry. In order to it, I do expect of him, in the first place, to make his own poem, without depending upon Phœbus for any part of it, or calling out for aid upon any of the muses by name. I do likewise positively forbid the sending of Mercury with any particular message or dispatch relating to the peace; and shall by no means suffer Minerva to take upon her the shape of any plenipotentiary concerned in this great work. I do further declare, that I shall not allow the Destinies to have had a hand in the deaths of the several thousands who have been slain in the late war; being of opinion that all such deaths may be well accounted for by the Christian system of powder and ball. I do therefore strictly forbid the Fates to cut the thread of man's life upon any pretence whatsoever, unless it be for the sake of rhyme. And whereas I have good reason to fear, that Neptune will have a great deal of business on his hands in several poems which we may now suppose are upon the anvil, I do also prohibit his appearance, unless it be done in metaphor, simile, or any very short allusion; and that even here he may not be permitted to enter, but with great caution and circumspection. I desire that the same rule may be extended to his whole fraternity of Heathen gods; it being my design to condemn every poem to the flames in which Jupiter thunders, or exercises any other act of authority which does not belong to him. In short I expect that no pagan agent shall be introduced, or any fact related which a man cannot give credit to with a good conscience. Provided always that nothing herein contained shall extend, or be construed to extend to several of the female poets in this nation, who shall still be left in full possession of their gods and goddesses, in the same manner as if this paper had never been written." *Spect.* N° 523.

The marvellous is indeed so much promoted by machinery, that it is not wonderful to find it embraced by the bulk of writers, and perhaps of readers. If indulged at all, it is generally indulged to excess. Homer introduceth his deities with no greater ceremony than his mortals; and Virgil has still less moderation: a pilot spent with watching cannot fall asleep and drop into the sea by natural means: one bed cannot receive the two lovers Æneas and Dido, without the immediate interposition of superior powers. The ridiculous in such fictions must appear even through the thickest veil of gravity and solemnity.

Angels and devils serve equal with Heathen deities as materials for figurative language; perhaps better among Christians, because we believe in them, and not in Heathen deities. But every one is sensible, as well as Boileau, that the invisible powers in our creed make a much worse figure as actors in a modern poem than the invisible powers in the Heathen creed did in ancient poems; the cause of which is not far to seek. The Heathen deities, in the opinion of their votaries, were beings elevated one step only above mankind, subject to the same passions, and directed by the same motives; therefore not altogether improper to mix with men in an important action. In our creed superior beings are placed at such a mighty distance from us, and are of a nature so different, that with no propriety can we appear with them upon the same stage: man, a creature much inferior, loses all dignity in the comparison.

95

An historical poem admits of allegory, &c. under proper restrictions.

There can be no doubt that an historical poem admits the embellishment of allegory as well as of metaphor, simile, or other figure. Moral truth, in particular, is finely illustrated in the allegorical manner: it amuses the fancy to find abstract terms, by a sort of magic, metamorphosed into active beings; and it is delightful to trace a general proposition in a pictured event. But allegorical beings should be confined within their own sphere, and never be admitted to mix in the principal action, nor to co-operate in retarding or advancing the catastrophe; which would have a still worse effect than invisible powers: for the impression of real existence, essential to an epic poem, is inconsistent with that figurative existence which is essential to an allegory; and therefore no method can more effectually prevent the impression of reality than the introduction of allegorical beings co-operating with those whom we conceive to be really existing. The love episode in the Henriade (canto 9.), insufferable by the discordant mixture of allegory with real life, is copied from that of Rinaldo and Armida in the *Gierusalemme Liberata*, which hath no merit

Of the Epopee.

merit to entitle it to be copied. An allegorical object, ſuch as Fame in the Æneid, and the Temple of Love in the Henriade, may find place in a deſcription: but to introduce Diſcord as a real perſonage, imploring the aſſiſtance of Love as another real perſonage, to enervate the courage of the hero, is making theſe figurative beings act beyond their ſphere, and creating a ſtrange jumble of truth and fiction. The allegory of Sin and Death in the Paradiſe Loſt is poſſibly not generally reliſhed, though it is not entirely of the ſame nature with what we have been condemning; in a work comprehending the atchievements of ſuperior beings there is more room for fancy than where it is confined to human actions.

What is the true notion of an epiſode? or how is it to be diſtinguiſhed from the principal action? Every incident that promotes or retards the cataſtrophe muſt be part of the principal action. This clears the nature of an epiſode; which may be defined,
96 Epiſod defined.
"An incident connected with the principal action, but contributing neither to advance nor retard it." The deſcent of Æneas into hell does not advance or retard the cataſtrophe, and therefore is an epiſode. The ſtory of Niſus and Euryalus, producing an alteration in the affairs of the contending parties, is a part of the principal action. The family-ſcene in the ſixth book of the Iliad is of the ſame nature: for by Hector's retiring from the field of battle to viſit his wife, the Grecians had opportunity to breathe, and even to turn upon the Trojans. The unavoidable effect of an epiſode according to this defi-
97 What conſtitutes a good epiſode.
nition muſt be, to break the unity of action; and therefore it ought never to be indulged unleſs to unbend the mind after the fatigue of a long narration. An epiſode, when ſuch is its purpoſe, requires the following conditions: it ought to be well connected with the principal action; it ought to be lively and intereſting; it ought to be ſhort; and a time ought to be choſen when the principal action relents (E).

In the following beautiful epiſode, which cloſes the ſecond book of Fingal, all theſe conditions are united.

"Comal was a ſon of Albion; the chief of an hundred hills. His deer drunk of a thouſand ſtreams; and a thouſand rocks replied to the voice of his dogs. His face was the mildneſs of youth; but his hand the death of heroes. One was his love, and fair was ſhe! the daughter of mighty Conloch. She appeared like a ſunbeam among women, and her hair was like the wing of the raven. Her ſoul was fixed on Comal, and ſhe was his companion in the chace. Often met their eyes of love, and happy were their words in ſecret. But Gormal loved the maid, the chief of gloomy Ardven. He watched her lone ſteps on the heath, the foe of unhappy Comal.

"One day, tired of the chace, when the miſt had concealed their friends, Comal and the daughter of Conloch met in the cave of Ronan. It was the wonted haunt of Comal. Its ſides were hung with his arms; a hundred ſhields of thongs were there, a hundred helms of ſounding ſteel. Reſt here, ſaid he, my love Galvina, thou light of the cave of Ronan: a deer appears on Mora's brow; I go, but ſoon will return. I fear, ſaid ſhe, dark Gormal my foe: I will reſt here; but ſoon return, my love.

"He went to the deer of Mora. The daughter of Conloch, to try his love, clothed her white ſide with his armour, and ſtrode from the cave of Ronan. Thinking her his foe, his heart beat high, and his colour changed. He drew the bow: the arrow flew: Galvina fell in blood. He ran to the cave with haſty ſteps, and called the daughter of Conloch. Where art thou, my love? but no anſwer.——He marked, at length, her heaving heart beating againſt the mortal arrow. O Conloch's daughter, is it thou!—he ſunk upon her breaſt.

"The hunters found the hapleſs pair. Many and ſilent were his ſteps round the dark dwellings of his love. The fleet of the ocean came: he fought, and the ſtrangers fell: he ſearched for death over the field; but who could kill the mighty Comal? Throwing away his ſhield, an arrow found his manly breaſt. He ſleeps with his Galvina: their green tombs are ſeen by the mariner when he bounds on the waves of the north."

Next, upon the peculiarities of a *dramatic poem*. And
98 Double plot in a drama ſeldom ſucceſsful.
the firſt we ſhall mention is a double plot: one of which muſt reſemble an epiſode in an epic poem; for it would diſtract the ſpectator, inſtead of entertaining him, if he were forced to attend at the ſame time to two capital plots equally intereſting. And even ſuppoſing it an under-plot like an epiſode, it ſeldom hath a good effect in tragedy, of which ſimplicity is a chief property; for an intereſting ſubject that engages our affections, occupies our whole attention, and leaves no room for any ſeparate concern. Variety is more tolerable in comedy; which pretends only to amuſe, without totally occupying the mind. But even there, to make a double plot agreeable, is no ſlight effort of art: the under plot ought not to vary greatly in its tone from the principal; for diſcordant emotions are unpleaſant when jumbled together; which, by the way, is an inſuperable objection to tragi-comedy. Upon that account the Provok'd Huſband deſerves cenſure; all the ſcenes that bring the family of the Wrongheads into action, being ludicrous and farcical, are in a very different tone from the principal ſcenes, diſplaying ſevere and bitter expoſtulations between Lord Townley and his lady. The ſame objection touches not the double plot of the Careleſs Huſband; the different ſubjects being ſweetly connected, and having only ſo much variety as to reſemble ſhades of colours harmoniouſly mixed. But this is not all. The under-plot ought to be connected with that which is principal, ſo much at leaſt as to employ the ſame perſons: the under-plot ought to occupy the intervals or pauſes of the principal action; and both ought to be concluded together. This is the caſe of the Merry Wives of Windſor.

Violent action ought never to be repreſented on the
99 Violent action ought not to be repreſented.
ſtage. While the dialogue goes on, a thouſand particulars

(E) Homer's deſcription of the ſhield of Achilles is properly introduced at a time when the action relents, and the reader can bear an interruption. But the author of Telemachus deſcribes the ſhield of that young hero in the heat of battle; a very improper time for an interruption.

culars concur to delude us into an impression of reality; genuine sentiments, passionate language, and persuasive gesture: the spectator, once engaged, is willing to be deceived, loses sight of himself, and without scruple enjoys the spectacle as a reality. From this absent state he is roused by violent action; he wakes as from a pleasing dream; and, gathering his senses about him, finds all to be a fiction. Horace delivers the same rule; and founds it upon the same reason:

> Ne pueros coram populo Medea trucidet;
> Aut humana palam coquat exta nefarius Atreus;
> Aut in avem Progne vertatur, Cadmus in anguem:
> Quodcumque ostendis mihi sic, incredulus odi.

The French critics join with Horace in excluding blood from the stage; but overlooking the most substantial objection, they urge only that it is barbarous and shocking to a polite audience. The Greeks had no notion of such delicacy, or rather effeminacy; witness the murder of Clytemnestra by her son Orestes, passing behind the scene, as represented by Sophocles: her voice is heard calling out for mercy, bitter expostulations on his part, loud shrieks upon her being stabbed, and then a deep silence. An appeal may be made to every person of feeling, whether this scene be not more horrible than if the deed had been committed in sight of the spectators upon a sudden gust of passion. If Corneille, in representing the affair between Horatius and his sister, upon which the murder ensues behind the scene, had no other view but to remove from the spectators a shocking action, he was guilty of a capital mistake: for murder in cold blood, which in some measure was the case as represented, is more shocking to a polite audience, even where the conclusive stab is not seen, than the same act performed in their presence by violent and unpremeditated passion, as suddenly repented of as committed. Addison's observation is just *, That no part of this incident ought to have been represented, but reserved for a narrative, with every alleviating circumstance in favour of the hero.

* Spectator, Nº 43.

100 The proper conduct of the dialogue.

A few words upon the dialogue, which ought to be so conducted as to be a true representation of nature. We talk not here of the sentiments nor of the language (which are treated elsewhere); but of what properly belongs to dialogue-writing; where every single speech, short or long, ought to arise from what is said by the former speaker, and furnish matter for what comes after till the end of the scene. In this view, all the speeches from first to last represent so many links of one regular chain. No author, ancient or modern, possesses the art of dialogue equal to Shakespeare. Dryden, in that particular, may justly be placed as his opposite. He frequently introduces three or four persons speaking upon the same subject, each throwing out his own notions separately, without regarding what is said by the rest: take for an example the first scene of Aurenzebe. Sometimes he makes a number club in relating an event, not to a stranger, supposed ignorant of it, but to one another, for the sake merely of speaking; of which notable sort of dialogue we have a specimen in the first scene of the first part of the Conquest of Granada. In the second part of the same tragedy, scene second, the King, Abenamar, and Zulema, make their separate observations, like so many soliloquies, upon the fluctuating temper of the mob; a dialogue so uncouth puts one in mind of two shepherds in a pastoral excited by a prize to pronounce verses alternately, each in praise of his own mistress.

This manner of dialogue-writing, besides an unnatural air, has another bad effect; it stays the course of the action, because it is not productive of any consequence. In Congreve's comedies, the action is often suspended to make way for a play of wit.

No fault is more common among writers than to prolong a speech after the impatience of the person to whom it is addressed ought to prompt him or her to break in. Consider only how the impatient actor is to behave in the mean time. To express his impatience in violent action without interrupting would be unnatural; and yet to dissemble his impatience, by appearing cool where he ought to be highly inflamed, would be no less so.

Rhyme being unnatural and disgustful in dialogue, is happily banished from our theatre: the only wonder is that it ever found admittance, especially among a people accustomed to the more manly freedom of Shakespeare's dialogue. By banishing rhyme, we have gained so much as never once to dream that there can be any further improvement. And yet, however suitable blank verse may be to elevated characters and warm passions, it must appear improper and affected in the mouths of the lower sort. Why then should it be a rule, That every scene in tragedy must be in blank verse? Shakespeare, with great judgment, has followed a different rule; which is, to intermix prose with verse, and only to employ the latter where it is required by the importance or dignity of the subject. Familiar thoughts and ordinary facts ought to be expressed in plain language: to hear, for example, a footman deliver a simple message in blank verse must appear ridiculous to every one who is not biassed by custom. In short, that variety of characters and of situations, which is the life of a play, requires not only a suitable variety in the sentiments, but also in the diction.

§ 3. *The Three Unities.*

When we consider the chain of causes and effects in the material world, independent of purpose, design, or thought, we find a number of incidents in succession, without beginning, middle, or end: every thing that happens is both a cause and an effect; being the effect of what goes before, and the cause of what follows: one incident may affect us more, another less; but all of them are links in the universal chain: the mind, in viewing these incidents, cannot rest or settle ultimately upon any one; but is carried along in the train without any close.

But when the intellectual world is taken under view, in conjunction with the material, the scene is varied. Man acts with deliberation, will, and choice: he aims at some end; glory, for example, or riches, or conquest, the procuring happiness to individuals, or to his country in general: he proposes means, and lays plans to attain the end proposed. Here are a number of facts or incidents leading to the end in view, the whole composing one chain by the relation of cause and effect. In running over a series of such facts or incidents, we cannot rest upon any one; because they are presented to us as means only, leading to some end; but we rest with satisfaction upon the end or ultimate event; because there the purpose or aim of the chief person or persons is accomplished. This indicates the beginning, the middle, and

101 In what the unity of action consists.

The Three Unities.

and the end, of what Aristotle calls *an entire action* *. The story naturally begins with describing those circumstances which move the person who acts the principal part to form a plan, in order to compass some desired event; the prosecution of that plan, and the obstructions, carry the reader into the heat of action; the middle is properly where the action is the most involved; and the end is where the event is brought about, and the plan accomplished.

We have given the foregoing example of a plan crowned with success, because it affords the clearest conception of a beginning, a middle, and an end, in which consists *unity* of action; and indeed stricter unity cannot be imagined than in that case. But an action may have unity, or a beginning, middle, and end, without so intimate a relation of parts; as where the catastrophe is different from what is intended or desired, which frequently happens in our best tragedies. In the Æneid, the hero, after many obstructions, makes his plan effectual. The Iliad is formed upon a different model: it begins with the quarrel between Achilles and Agamemnon; goes on to describe the several effects produced by that cause; and ends in a reconciliation. Here is unity of action, no doubt, a beginning, a middle, and an end; but inferior to that of the Æneid, which will thus appear. The mind hath a propensity to go forward in the chain of history; it keeps always in view the expected event; and when the incidents or underparts are connected by their relation to the event, the mind runs sweetly and easily along them. This pleasure we have in the Æneid. It is not altogether so pleasant to connect, as in the Iliad, effects by their common cause; for such connection forces the mind to a continual retrospect; looking backward is like walking backward.

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102 Unity of action a capital beauty,

If unity of action be a capital beauty in fable imitative of human affairs, a plurality of unconnected fables must be a capital deformity. For the sake of variety we indulge an under-plot that is connected with the principal; but two unconnected events are extremely unpleasant, even where the same actors are engaged in both. Ariosto is quite licentious in that particular: he carries on at the same time a plurality of unconnected stories. His only excuse is, that his plan is perfectly well adjusted to his subject; for every thing in the *Orlando Furioso* is wild and extravagant.

Though to state facts in the order of time be natural, yet that order may be varied for the sake of conspicuous beauties. If, for example, a noted story, cold and simple in its first movements, be made the subject of an epic poem, the reader may be hurried into the heat of action; reserving the preliminaries for a conversation piece, if thought necessary; and that method, at the same time, has a peculiar beauty from being dramatic. But a privilege that deviates from nature ought to be sparingly indulged; and yet romance writers make no difficulty of presenting to the reader, without the least preparation, unknown persons engaged in some arduous adventure equally unknown. In Cassandra, two personages, who afterwards are discovered to be the heroes of the fable, start up completely armed upon the banks of the Euphrates, and engage in a single combat.

A play analysed is a chain of connected facts, of which each scene makes a link. Each scene, accordingly, ought to produce some incident relative to the catastrophe or ultimate event, by advancing or retarding it. A scene that produceth no incident, and for that reason may be termed *barren*, ought not to be indulged, because it breaks the unity of action: a barren scene can never be intitled to a place, because the chain is complete without it. In the Old Bachelor, the 3d scene of act 2. and all that follow to the end of that act, are mere conversation-pieces, productive of no consequence. The 10th and 11th scenes, act 3. Double Dealer, and the 10th, 11th, 12th, 13th, and 14th scenes, act 1. Love for Love, are of the same kind. Neither is The Way of World entirely guiltless of such scenes. It will be no justification that they help to display characters: it were better, like Dryden in his *dramatis personæ*, to describe characters beforehand, which would not break the chain of action. But a writer of genius has no occasion for such artifice; he can display the characters of his personages much more to the life in sentiment and action. How successfully is this done by Shakespeare! in whose works there is not to be found a single barren scene.

Upon the whole, it appears, that all the facts in an historical fable ought to have a mutual connection, by their common relation to the grand event or catastrophe. And this relation, in which the *unity* of action consists, is equally essential to epic and dramatic compositions.

103 Whether unity of time and of place be essential.

How far the unities of time and of place are essential, is a question of greater intricacy. These unities were strictly observed in the Greek and Roman theatres; and they are inculcated by the French and English critics as essential to every dramatic composition. In theory these unities are also acknowledged by our best poets, though their practice seldom corresponds: they are often forced to take liberties, which they pretend not to justify, against the practice of the Greeks and Romans, and against the solemn decision of their own countrymen. But in the course of this inquiry it will be made evident, that in this article we are under no necessity to copy the ancients; and that our critics are guilty of a mistake, in admitting no greater latitude of place and time than was admitted in Greece and Rome.

Indeed the unities of place and time are not, by the most rigid critics, required in a narrative poem. In such composition, if it pretend to copy nature, these unities would be absurd; because real events are seldom confined within narrow limits either of place or of time: and yet we can follow history, or an historical fable, through all its changes, with the greatest facility; we never once think of measuring the real time by what is taken in reading; nor of forming any connection between the place of action and that which we occupy.

We are aware, that the drama differs so far from the epic as to admit different rules. It will be observed, "That an historical fable, intended for reading solely, is under no limitation of time or of place more than a genuine history; but that a dramatic composition cannot be accurately represented unless it be limited, as its representation is, to one place and to a few hours; and therefore that no fable can be admitted but what has these properties, because it would be absurd to compose a piece for representation that cannot be justly represented." This argument has at least a plausible appearance; and yet one is apt to suspect some fallacy, considering that no critic, however strict, has ventured to confine the unities of place and of time within so narrow bounds.

A view of the Grecian drama, compared with our own, may

* Poet. c. 6.

The three Unities. may perhaps relieve us from this dilemma: if they be differently conſtructed, as ſhall be made evident, it is poſſible that the foregoing reaſoning may not be equally applicable to both.

104 They were eſſential to the Greek drama, but

All authors agree, that tragedy in Greece was derived from the hymns in praiſe of Bacchus, which were ſung in parts by a chorus. Theſpis, to relieve the ſingers, and for the ſake of variety, introduced one actor, whoſe province it was to explain hiſtorically the ſubject of the ſong, and who occaſionally repreſented one or other perſonage. Eſchylus, introducing a ſecond actor, formed the dialogue, by which the performance became dramatic; and the actors were multiplied when the ſubject repreſented made it neceſſary. But ſtill the chorus, which gave a beginning to tragedy, was conſidered as an eſſential part. The firſt ſcene, generally, unfolds the preliminary circumſtances that lead to the grand event; and this ſcene is by Ariſtotle termed the *prologue*. In the ſecond ſcene, where the action properly begins, the chorus is introduced, which, as originally, continues upon the ſtage during the whole performance: the chorus frequently makes one in the dialogue; and when the dialogue happens to be ſuſpended, the chorus, during the interval, is employed in ſinging. Sophocles adheres to this plan religiouſly. Euripides is not altogether ſo correct. In ſome of his pieces it becomes neceſſary to remove the chorus for a little time: but when that unuſual ſtep is riſked, matters are ſo ordered as not to interrupt the repreſentation: the chorus never leave the ſtage of their own accord, but at the command of ſome principal perſonage, who conſtantly waits their return.

Thus the Grecian drama is a continued repreſentation without any interruption; a circumſtance that merits attention. A continued repreſentation without a pauſe affords not opportunity to vary the place of action, nor to prolong the time of the action beyond that of the repreſentation. To a repreſentation ſo confined in place and time, the foregoing reaſoning is ſtrictly applicable: a real or feigned action, that is brought to a concluſion after conſiderable intervals of time and frequent changes of place, cannot accurately be copied in a repreſentation that admits no latitude in either. Hence it is, that the unities of place and of time, were, or ought to have been, ſtrictly obſerved in the Greek tragedies; which is made neceſſary by the very conſtitution of their drama, for it is abſurd to compoſe a tragedy that cannot be juſtly repreſented.

105 not to the French or Engliſh.

Modern critics, who for our drama pretend to eſtabliſh rules founded on the practice of the Greeks, are guilty of an egregious blunder. The unities of place and of time were in Greece, as we ſee, a matter of neceſſity, not of choice; and it is eaſy to ſhow, that if we ſubmit to ſuch fetters, it muſt be from choice, not neceſſity. This will be evident upon taking a view of the conſtitution of our drama, which differs widely from that of Greece; whether more or leſs perfect, is a different point, to be handled afterward. By dropping the chorus, opportunity is afforded to divide the repreſentation by intervals of time, during which the ſtage is evacuated, and the ſpectacle ſuſpended. This qualifies our drama for ſubjects ſpread through a wide ſpace both of time and of place: the time ſuppoſed to paſs during the ſuſpenſion of the repreſentation is not meaſured by the time of the ſuſpenſion; and any place may be ſuppoſed, as it is not in ſight: by which means, many ſubjects can be juſtly repreſented in our theatres, that were excluded from thoſe of ancient Greece. This doctrine may be illuſtrated, by comparing a modern play to a ſet of hiſtorical pictures; let us ſuppoſe them five in number, and the reſemblance will be complete: each of the pictures reſembles an act in one of our plays: there muſt neceſſarily be the ſtricteſt unity of place and of time in each picture; and the ſame neceſſity requires theſe two unities during each act of a play, becauſe during an act there is no interruption in the ſpectacle. Now, when we view in ſucceſſion a number of ſuch hiſtorical pictures, let it be, for example, the hiſtory of Alexander by Le Brun, we have no difficulty to conceive, that months or years have paſſed between the events exhibited in two different pictures, though the interruption is imperceptible in paſſing our eye from the one to the other; and we have as little difficulty to conceive a change of place, however great: in which view, there is truly no difference between five acts of a modern play and five ſuch pictures. Where the repreſentation is ſuſpended, we can with the greateſt facility ſuppoſe any length of time or any change of place: the ſpectator, it is true, may be conſcious, that the real time and place are not the ſame with what are employed in the repreſentation; but this is the work of reflection; and by the ſame reflection he may alſo be conſcious, that Garrick is not King Lear, that the playhouſe is not Dover cliffs, nor the noiſe he hears thunder and lightning. In a word, after an interruption of the repreſentation, it is not more difficult for a ſpectator to imagine a new place, or a different time, than, at the commencement of the play, to imagine himſelf at Rome, or in a period of time two thouſand years back. And indeed, it is abundantly ridiculous, that a critic, who is willing to hold candlelight for ſunſhine, and ſome painted canvaſſes for a palace or a priſon, ſhould affect ſo much difficulty in imagining a latitude of place or of time in the fable, beyond what is neceſſary in the repreſentation.

106 Great latitude in time, however, not to be indulged,

There are, it muſt be acknowledged, ſome effects of great latitude in time that ought never to be indulged in a compoſition for the theatre: nothing can be more abſurd, than at the cloſe to exhibit a full-grown perſon who appears a child at the beginning: the mind rejects, as contrary to all probability, ſuch latitude of time as is requiſite for a change ſo remarkable. The greateſt change from place to place hath not altogether the ſame bad effect: in the bulk of human affairs place is not material; and the mind, when occupied with an intereſting event, is little regardful of minute circumſtances: theſe may be varied at will, becauſe they ſcarcely make any impreſſion.

107 nor in place.

At the ſame time, it is not here meant to juſtify liberty without any reſerve. An unbounded licence with relation to place and time, is faulty, for a reaſon that ſeems to have been overlooked, which is, that it ſeldom fails to break the unity of action: in the ordinary courſe of human affairs, ſingle events, ſuch as are fit to be repreſented on the ſtage, are confined to a narrow ſpot, and generally employ no great extent of time; and accordingly we ſeldom find ſtrict unity of action in a dramatic compoſition, where any remarkable latitude is indulged in theſe particulars. It may even be admitted, that a compoſition which employs but one place, and requires not a greater length of time than is neceſſary for the repreſentation, is ſo

Elem. of Criticiſm, chap. 23.

The three Unities.

so much the more perfect; because the confining an event within so narrow bounds, contributes to the unity of action, and also prevents that labour, however slight, which the mind must undergo in imagining frequent changes of place, and many intervals of time. But still we must insist that such limitation of place and time as was necessary in the Grecian drama, is no rule to us; and therefore, that though such limitation adds one beauty more to the composition, it is at best but a refinement, which may justly give place to a thousand beauties more substantial. And we may add, that it is extremely difficult, if not impracticable, to contract within the Grecian limits any fable so fruitful of incidents in number and variety as to give full scope to the fluctuation of passion.

It may now appear, that critics who put the unities of place and of time upon the same footing with the unity of action, making them all equally essential, have not attended to the nature and constitution of the modern drama. If they admit an interrupted representation, with which no writer finds fault, it is absurd to reject its greatest advantage, that of representing many interesting subjects excluded from the Grecian stage. If there needs must be a reformation, why not restore the ancient chorus and the ancient continuity of action? There is certainly no medium; for to admit an interruption without relaxing from the strict unities of place and of time, is in effect to load us with all the inconveniences of the ancient drama, and at the same time to withhold from us its advantages.

108 Whether our drama be preferable to that of Greece.

And therefore the only proper question is, Whether our model be or be not a real improvement? This indeed may fairly be called in question; and in order to a comparative trial, some particulars must be premised. When a play begins, we have no difficulty to adjust our imagination to the scene of action, however distant it be in time or in place; because we know that the play is a representation only. The case is very different after we are engaged: it is the perfection of representation to hide itself, to impose on the spectator, and to produce in him an impression of reality, as if he were spectator of a real event; but any interruption annihilates that impression, by rousing him out of his waking dream, and unhappily restoring him to his senses. So difficult it is to support the impression of reality, that much slighter interruptions than the interval between two acts are sufficient to dissolve the charm: in the 5th act of the *Mourning Bride*, the three first scenes are in a room of state, the fourth in the prison; and the change is operated by shifting the scene, which is done in a trice: but however quick the transition may be, it is impracticable to impose upon the spectators so as to make them conceive that they are actually carried from the palace to the prison; they immediately reflect, that the palace and prison are imaginary, and that the whole is a fiction.

From these premises, one will naturally be led, at first view, to pronounce the frequent interruptions in the modern drama to be an imperfection. It will occur, "That every interruption must have the effect to banish the dream of reality, and with it to banish our concern, which cannot subsist while we are conscious that all is a fiction; and therefore, that in the modern drama, sufficient time is not afforded for fluctuation and swelling of passion, like what is afforded in that of Greece, where there is no interruption." This reasoning, it must be owned, has a specious appearance: but we must not become faint-hearted upon the first repulse; let us rally our troops for a second engagement.

The three Unities.

On the Greek stage, whatever may have been the case on the Roman, the representation was never interrupted, and the division by acts was totally unknown. The word *act* never once occurs in Aristotle's Poetics, in which he defines exactly every part of the drama, and divides it into the beginning, the middle, and the end. At certain intervals indeed the actors retired; but the stage was not then left empty, nor the curtain let fall; for the chorus continued and sung. Neither do these songs of the chorus divide the Greek tragedies into five portions similar to our acts: though some of the commentators have endeavoured to force them into this office. But it is plain, that the intervals at which the chorus sung are extremely unequal and irregular, suited to the occasion and the subject; and would divide the play sometimes into three, sometimes into seven or eight acts.

As practice has now established a different plan on the modern stage, has divided every play into five acts, and made a total pause in the representation at the end of each act, the question to be considered is, Whether the plan of the ancient or of the modern drama is best qualified for making a deep impression on the mind? That the preference is due to the plan of the modern drama, will be evident from the following considerations. If it be indeed true, as the advocates for the three unities allege, that the audience is deluded into the belief of the reality of a well-acted tragedy, it is certain that this delusion cannot be long supported; for when the spirits are exhausted by close attention, and by the agitation of passion, an uneasiness ensues, which never fails to banish the waking dream. Now supposing the time that a man can employ with strict attention without wandering to be no greater than is requisite for a single act (a supposition that cannot be far from truth), it follows, that a continued representation of longer endurance than an act, instead of giving scope to fluctuation and swelling of passion, would overstrain the attention, and produce a total absence of mind. In this respect, the four pauses have a fine effect: for by affording to the audience a seasonable respite when the impression of reality is gone, and while nothing material is in agitation, they relieve the mind from its fatigue: and consequently prevent a wandering of thought at the very time possibly of the most interesting scenes.

In one article, indeed, the Grecian model has greatly the advantage: its chorus, during an interval, not only preserves alive the impressions made upon the audience, but also prepares their hearts finely for new impressions. In our theatres, on the contrary, the audience, at the end of every act, being left to trifle time away, lose every warm impression; and they begin the next act cool and unconcerned, as at the commencement of the representation. This is a gross malady in our theatrical representations; but a malady that luckily is not incurable: to revive the Grecian chorus, would be to revive the Grecian slavery of place and time; but we can figure a detached chorus coinciding with a pause in the representation, as the ancient chorus did with a pause in the principal action. What objection, for example, can there lie against music between the acts, vocal and instrumental,

detached ... without putting us under ... tion of time ... ace, would recruit the spirits, and would preserve ... e the tone, if not the tide, of passion: the music, ... an act, should commence in the tone of the preceding passion, and be gradually varied till it accord with the tone of the passion that is to succeed in the next ... The music and the representation would both of them be gainers by their conjunction; which will thus appear. Music that accords with the present tone of mind, is, on that account, doubly agreeable; and accordingly, though music singly hath not power to raise a passion, it tends greatly to support a passion already raised. Further, music prepares us for the passion that follows, by making cheerful, tender, melancholy, or animated impressions, as the subject requires. Take for an example the first scene of the *Mourning Bride*, where soft music, in a melancholy strain, prepares us for Almeria's deep distress. In this manner, music and representation support each other delightfully: the impression made upon the audience by the representation, is a fine preparation for the music that succeeds; and the impression made by the music is a fine preparation for the representation that succeeds. It appears evident, that by some such contrivance, the modern drama may be improved, so as to enjoy the advantage of the ancient chorus without its slavish limitation of place and time. But to return to the comparison between the ancient and the modern drama.

Ele. of Criticism, chap. 23.

110 The modern drama preferable to the ancient.

The numberless improprieties forced upon the Greek dramatic poets by the constitution of their drama, may be sufficient, one should think, to make us prefer the modern drama, even abstracting from the improvement proposed. To prepare the reader for this article, it must be premised, that as in the ancient drama the place of action never varies, a place necessarily must be chosen to which every person may have access without any improbability. This confines the scene to some open place, generally the court or area before a palace; which excludes from the Grecian theatre transactions within doors, though these commonly are the most important. Such cruel restraint is of itself sufficient to cramp the most pregnant invention; and accordingly the Greek writers, in order to preserve unity of place, are reduced to woful improprieties. In the *Hippolytus* of Euripides (act i. sc. 6.), Phædra, distressed in mind and body, is carried without any pretext from her palace to the place of action; is there laid upon a couch, unable to support herself upon her limbs; and made to utter many things improper to be heard by a number of women who form the chorus: and what is still more improper, her female attendant uses the strongest entreaties to make her reveal the secret cause of her anguish; which at last Phædra, contrary to decency and probability, is prevailed upon to do in presence of that very chorus (act ii. sc. 2.). Alcestes, in Euripides, at the point of death, is brought from the palace to the place of action, groaning and lamenting her untimely fate (act ii. sc. 1.). In the *Trachiniæ* of Sophocles (act. ii.), a secret is imparted to Dejanira, the wife of Hercules, in presence of the chorus. In the tragedy of *Iphigenia*, the messenger employed to inform Clytemnestra that Iphigenia was sacrificed, stops short at the place of action, and with a loud voice calls the queen from her palace to hear the news. Again, i... T...is (act iv.), the necessary presence ... into a gross absurdity, whic... ing; and, to disguise ... to the chorus, not one wo... them to secrecy. In the *Medea* of Eur... cess makes no difficulty, in presence of the chor... plot the death of her husband, of his mistress, and of her father the king of Corinth, all by poison: it was necessary to bring Medea upon the stage; and there is but one place of action, which is always occupied by the chorus. This scene closes the second act; and in the end of the third, she frankly makes the chorus her confidants in plotting the murder of her own children. Terence, by identity of place, is often forced to make a conversation within doors be heard on the open street: the cries of a woman in labour are there heard distinctly.

The three Unities.

111 Inconveniences of the plan of the ancient drama.

The Greek poets are not less hampered by unity of time than by that of place. In the *Hippolytus* of Euripides, that prince is banished at the end of the 4th act; and in the first scene of the following act, a messenger relates to Theseus the whole particulars of the death of Hippolytus by the sea-monster: that remarkable event must have occupied many hours; and yet in the representation it is confined to the time employed by the chorus upon the song at the end of the 4th act. The inconsistency is still greater in the *Iphigenia in Tauris* (act v. sc. 4.): the song could not exhaust half an hour; and yet the incidents supposed to have happened during that time could not naturally have been transacted in less than half a day.

The Greek artists are forced, not less frequently, to transgress another rule, derived also from a continued representation. The rule is, that as a vacuity, however momentary, interrupts the representation, it is necessary that the place of action be constantly occupied. Sophocles, with regard to that rule as well as to others, is generally correct: but Euripides cannot bear such restraint; he often evacuates the stage, and leaves it empty for others. Iphigenia in Tauris, after pronouncing a soliloquy in the first scene, leaves the place of action, and is succeeded by Orestes and Pylades: they, after some conversation, walk off; and Iphigenia re-enters, accompanied with the chorus. In the Alcestes, which is of the same author, the place of action is void at the end of the third act. It is true, that to cover the irregularity, and to preserve the representation in motion, Euripides is careful to fill the stage without loss of time: but this still is an interruption, and a link of the chain broken: for during the change of the actors, there must be a space of time, during which the stage is occupied by neither set. It makes indeed a more remarkable interruption, to change the place of action as well as the actors; but that was not practicable upon the Grecian stage.

It is hard to say upon what model Terence has formed his plays. Having no chorus, there is a pause in the representation at the end of every act: but advantage is not taken of the cessation, even to vary the place of action; for the street is always chosen, where every thing passing may be seen by every person; and by that choice, the most sprightly and interesting parts of the action, which commonly passes within doors, are exclud-

The three Unities.

ed; witness th ... He hath sub- ... ſt to time. In a ... , is not more confined ... re. Thus a zealous ... ancient forms and ceremonies, ... conſidering whether their introductive ... be ſtill ſubſiſting. Plautus, of a bolder genius than Terence, makes good uſe of the liberty afforded by an interrupted repreſentation: he varies the place of action upon all occaſions, when the variation ſuits his purpoſe.

112 No change of time or place to be admitted but between the acts.

The intelligent reader will by this time underſtand, that we plead for no change of place in our plays but after an interval, nor for any latitude in point of time but what falls in with an interval. The unities of place and time ought to be ſtrictly obſerved during each act; for during the repreſentation there is no opportunity for the ſmalleſt deviation from either. Hence it is an eſſential requiſite, that during an act the ſtage be always occupied; for even a momentary vacuity makes an interval or interruption. Another rule is no leſs eſſential: it would be a groſs breach of the unity of action to exhibit upon the ſtage two ſeparate actions at the ſame time; and therefore, to preſerve that unity, it is neceſſary that each perſonage introduced during an act be linked to thoſe in poſſeſſion of the ſtage, ſo as to join all in one action. Theſe things follow from the very conception of an act, which admits not the ſlighteſt interruption: the moment the repreſentation is intermitted, there is an end of that act; and we have no other notion of a new act, but where, after a pauſe or interval, the repreſentation is again put in motion. French writers, generally ſpeaking, are correct in this particular. The Engliſh, on the contrary, are ſo irregular as ſcarce to deſerve a criticiſm; actors not only ſucceed each other in the ſame place without connection, but, what is ſtill leſs excuſable, they frequently ſucceed each other in different places. This change of place in the ſame act ought never to be indulged; for, beſide breaking the unity of the act, it has a diſagreeable effect: after an interval, the imagination adapts itſelf to any place that is neceſſary, as readily as at the commencement of the play; but during the repreſentation we reject change of place. From the foregoing cenſure muſt be excepted the *Mourning Bride* of Congreve, where regularity concurs with the beauty of ſentiment and of language, to make it one of the moſt complete pieces England has to boaſt of. It is acknowledged, however, that in point of regularity this elegant performance is not altogether unexceptionable. In the four firſt acts, the unities of place and time are ſtrictly obſerved: but in the laſt act, there is a capital error with reſpect to unity of place; for in the three firſt ſcenes of that act, the place of action is a room of ſtate, which is changed to a priſon in the fourth ſcene: the chain alſo of the actors is broken; as the perſons introduced in the priſon are different from thoſe who made their appearance in the room of ſtate. This remarkable interruption of the repreſentation makes in effect two acts inſtead of one: and therefore, if it be a rule that a play ought not to conſiſt of more acts than five, this performance is ſo far defective in point of regularity. It may be added, that, even admitting ſix acts, the irregularity would not be altogether removed, without a longer pauſe in the repreſentation than is allowed in the acting; for m ... ſite for enab ... imagination readily to fall in ... a new plac , or with a wide ſpace of time. In ... *Way of the World*, of the ſame author, unity of pla ... preſerved during every act, and a ſtricter unity of ... during the whole play than is neceſſary.

§ 4. *Of the Opera.*

The drama represented by music,

An opera is a drama repreſented by muſic. This entertainment was invented at Venice. An exhibition of this ſort requires a moſt brilliant magnificence, and an expence truly royal. The drama muſt neceſſarily be compoſed in verſe; for as operas are ſung and accompanied with ſymphonies, they muſt be in verſe to be properly applicable to muſic. To render this entertainment ſtill more brilliant, it is ornamented with dances and ballets, with ſuperb decorations, and ſurpriſing machinery. The dreſſes of the actors, of thoſe who aſſiſt in the chorus, and of the dancers, being all in the moſt ſplendid and elegant taſte, contribute to render the exhibition highly ſumptuous. But notwithſtanding this union of arts and pleaſures at an immenſe expence, and notwithſtanding a moſt dazzling pageantry, an opera appears, in the eyes of many people of taſte, but as a magnificent abſurdity, ſeeing that nature is never there from the beginning to the end. It is not our buſineſs here, however, to determine between the different taſtes of mankind.

The method of expreſſing our thoughts by ſinging and muſic is ſo little natural, and has ſomething in it ſo forced and affected, that it is not eaſy to conceive how it could come into the minds of men of genius to repreſent any human action, and, what is more, a ſerious or tragic action, any otherwiſe than by ſpeech. We have, it is true, operas in Engliſh by Addiſon, &c. in Italian by Metaſtaſio, in French by M. Quinault, Fontenelle, &c. the ſubjects of which are ſo grave and tragic, that one might call them muſical tragedies, and real *chefs d'œuvres* in their kind. But though we are highly ſatisfied and greatly affected on reading them, and are much pleaſed with ſeeing them repreſented, yet the ſpectator is, perhaps, more charmed with the magnificence of the ſight and the beauty of the muſic, than moved with the action and the tragical part of the performance. We are not, however, of that order of critics who ſtrive to prove, that mankind act wrong in finding pleaſure in an object with which they are really pleaſed; who blame a lover for thinking his miſtreſs charming, when her features are by no means regular; and who are perpetually applying the rules of logic to the works of genius: we make theſe obſervations merely in order to examine if it be not poſſible to augment the pleaſures of a polite people, by making the opera ſomething more natural, more probable, and more conſonant to reaſon. *Bielfeld's Elem. of Erudition.*

114 should take its subject not from history but from fable and enchantment.

We think, therefore, that the poet ſhould never, or at leaſt very rarely, chooſe a ſubject from hiſtory, but from fable or mythology, or from the regions of enchantment. Every rational mind is conſtantly ſhocked to hear a mutilated hero trill out, from the ſlender pipe of a chaffinch, *To arms! To arms!* and in the ſame tone animate his ſoldiers, and lead them to the aſſault; or harangue an aſſembly of grave ſenators, and ſometimes a whole body of people. Nothing can be more

Of the Opera.

more burlesque than such exhibitions; and a man must be possessed of a very uncommon sensibility to be affected by them. But as we know not what was the language of the gods, and their manner of expressing themselves, we are at liberty in that case to form what illusions we please, and to suppose that they sung to distinguish themselves from mortals. Besides, all the magic of decorations and machinery become natural, and even necessary, in these kinds of subjects; and therefore readily afford opportunity for all the pomp of these performances. The chorus, the dances, the ballettes, the symphonies and dresses, may likewise be all made to correspond with such subjects, nothing is here affected, absurd, or unnatural. Whoever is possessed of genius, and is well acquainted with mythology, will there find an inexhaustible source of subjects highly diversified, and quite proper for the drama of an opera.

We shall not speak here of that sort of music which appears to us the most proper for such a drama, and of the several alterations of which we think it susceptible in order to make it more complete, and to adapt it to a more pathetic, more noble, and more natural expression, as well in the recitatives as in the airs and chorus. (See MUSIC). We have only here to consider the business of the poet. He should never lose sight of nature even in the midst of the greatest fiction. A god, a demi-god, a renowned hero, such for example as Renaud in *Armida*, a fairy, a genii, a nymph, or fury, &c. should constantly be represented according to the characters we give them, and never be made to talk the language of a fop or a *petite maitresse*. The recitative, which is the ground-work of the dialogue, requires verses that are free and not regular, such as with a simple cadence approach the nearest to common language. The airs should not be forced into the piece, nor improperly placed for the sake of terminating a scene, or to display the voice of a performer; they should express some sentiment, or some precept, short and striking, or tender and affecting; or some simile lively and natural; and they should arise of themselves from a monologue, or from a scene between two persons: prolixity should here be particularly avoided, especially when such an air makes part of a dialogue; for nothing is more insipid or disgustful than the countenances of the other actors who appear at the same time, whose silence is quit unmeaning, and who know not what to do with their hands and feet while the singer is straining his throat. The verse of all the airs should be of the lyric kind, and should contain some poetic image, or paint some noble passion, which may furnish the composer with an opportunity of displaying his talents, and of giving a lively and affecting expression to the music. A phrase that is inanimated can never have a good effect in the performance, but must become insipid and horribly tedious in the air. The trite similies of the Italians, of a stream that flows, or a bird that flies, &c. are no longer sufferable. The same thing may be said with regard to the chorus, which should be equally natural and well adapted: it is here sometimes a whole people, sometimes the inhabitants of a peculiar country, and sometimes warriors, nymphs, or priests, &c. who raise their voice to demand justice, to implore favour, or render a general homage. The action itself will furnish the poet of genius with ideas, words, and the manner of disposing them.

115 [a]nd should [r]epresent [i]ts charac[t]ers as con[s]istent.

Lastly, the opera being a performance calculated less to satisfy the understanding than to charm the ear and affect the heart, and especially to strike the sight, the poet should have a particular attention to that object, should be skilled in the arts of a theatre, should know how to introduce combats, ballets, feasts, games, pompous entries, solemn processions, and such marvellous incidents as occur in the heavens, upon earth, in the sea, and even in the infernal regions: but all these matters demand a strong character, and the utmost precision in the execution: for otherwise, the comic being a near neighbour to the sublime, they will easily become ridiculous. The unity of action must certainly be observed in such a poem, and all the incidental episodes must concur to the principal design; otherwise it would be a monstrous chaos. It is impossible, however, scrupulously to observe the unity of time and place: though the liberty, which reason allows the poet in this respect, is not without bounds; and the less use he makes of it, the more perfect his poem will be. It is not perhaps impossible so to arrange the objects, that, in changing the decorations, the painter may constantly make appear some part of the principal decoration which characterises the situation of the scene, as the corner of a palace, at the end of a garden, or some avenue that leads to it, &c. But all this is liable to difficulties, and even to exceptions; and the art of the painter must concur in such case with that of the poet. For the rest, all the operas of Europe are at least one third too long; especially the Italian. The unity of action requires brevity, and satiety is inseparable from a diversion that lasts full four hours, and sometimes longer.

116 Unity of action necessary to the opera.

They have indeed endeavoured to obviate this inconvenience by dividing an opera into three, and even into five acts; but experience proves, that this division, though judicious, is still not sufficient to relieve the wearied attention.

SECT. II. *Of Lyric Poetry.*

117 Origin of the ode.

THE ode is very ancient, and was probably the first species of poetry. It had its source, we may suppose, from the heart, and was employed to express, with becoming fervour and dignity, the grateful sense man entertained of the blessings which daily flowed from God the fountain of all goodness: hence their harvest hymns, and other devotional compositions of that kind.

But in process of time it was employed, not only to praise the Almighty for bounties received, but to solicit his aid in time of trouble; as is plain from the odes written by King David and others, and collected by the Jewish Sanhedrim into the book of Psalms, to be sung at their fasts, festivals, and on other solemn occasions. Nor was this practice confined to the Israelites only: other nations had their songs of praise and petitions of this sort, which they preferred to their deities, in time of public prosperity and public distress, as well as to those heroes who distinguished themselves in arms. Even the American Indians, whose notions of religion are extremely confined, have their war-songs, which they sing to this day.

It

Of Lyric Poetry.

It is reasonable to suppose that the awful purpose to which the ode was applied, gave rise among the ancients to the custom of invoking the muses; and that the poets in order to raise their sentiments and language, so as to be acceptable to their deities, thought it expedient to solicit some divine assistance. Hence poets are said to have been inspired, and hence an unbounded liberty has been given to the ode; for the lyric poet, fired, as it were, with his subject, and borne away on the wings of gratitude, disdains grammatical niceties and common modes of speech, and often soars above rule, though not above reason. This freedom, however, consists chiefly in sudden transitions, bold digressions, and lofty excursions. For the ancient poets, and even Pindar, the most daring and lofty of them all, has in his sublimest flights, and amidst all his rapture, preserved harmony, and often uniformity in his versification: but so great is the variety of his measures, that the traces of sameness are in a manner lost; and this is one of the excellencies for which that poet is admired, and which, though seemingly devoid of art, requires so much that he has seldom been imitated with success.

118 Its freedom.

The ancients in their odes indulged such a liberty of fancy, that some of their best poets not only make bold excursions and digressions, but, having in their flights started some new and noble thought, they frequently pursue it, and never more return to their subject. But this loose kind of ode, which seems to reject all method, and in which the poet, having just touched upon his subject, immediately diverts to another, we should think blameable, were it lawful to call in question the authority of those great men who were our preceptors in this art. We may venture to affirm, however, that these compositions stand in no degree of comparison with other odes of theirs; in which, after wandering from the subject in pursuit of new ideas arising from some of its adjunctions, and ranging wantonly, as it were, through a variety of matter, the poet is from some other circumstance led naturally to his subject again; and, like, a bee, having collected the essence of many different flowers, returns home, and unites them all in one uniform pleasing sweet.

119 The subjects of the ode.

The ode among the ancients signified no more than a song: but with the moderns, the ode and the song are considered as different compositions; the ode being usually employed in grave and lofty subjects, and seldom sung but on solemn occasions.

The subjects most proper for the ode and song, Horace has pointed out in a few elegant lines.

> Gods, heroes, conquerors, *Olympic* crowns,
> Love's pleasing cares, and the free joys of wine,
> Are proper subjects for the lyric song.

To which we may add, that happiness, the pleasures of a rural life, and such parts of morality as afford lessons for the promotion of our felicity, and reflections on the conduct of life, are equally suitable to the ode. This both *Pindar* and *Horace* were so sensible of, that many of their odes are seasoned with these moral sentences and reflections.

> But who can number ev'ry sandy grain
> Wash'd by *Sicilia's* hoarse-resounding main?
> Or who can *Theron's* gen'rous works express,
> And tell how many hearts his bounteous virtues bless?
>
> *Ode to* THERON.

And in another Olympic ode, inscribed by the same poet to Diagoras of Rhodes (and in such esteem, that it was deposited in the temple of Minerva, written in letters of gold), Pindar, after exalting them to the skies, concludes with this lesson in life:

> Yet as the gales of fortune various blow,
> To-day tempestuous, and to-morrow fair,
> Due bounds, ye Rhodians, let your transports know;
> Perhaps to-morrow comes a storm of care.
>
> *West's* PINDAR.

> The man resolv'd and steady to his trust,
> Inflexible to ill, and obstinately just,
> May the rude rabble's insolence despise,
> Their senseless clamours and tumultuous cries;
> The tyrant's fierceness he beguiles,
> And the stern brow and the harsh voice defies,
> And with superior greatness smiles.
> Not the rough whirlwind, that deforms
> Adria's black gulf, and vexes it with storms,
> The stubborn virtue of his soul can move;
> Nor the red arm of angry Jove,
> That flings the thunder from the sky,
> And gives it rage to roar, and strength to fly.
> Should the whole frame of nature round him break,
> In ruin and confusion hurl'd,
> He unconcern'd would hear the mighty crack,
> And stand secure amidst a falling world.
>
> HORACE.

M. Despreaux has given us a very beautiful and just description of the ode in the following lines.

> L'Ode avec plus d'éclat, & non moins d'énergie
> Elevant jusqu'au ciel son vol ambitieux,
> Entretient dans vers commerce avec les Dieux.
> Aux Athletes dans Pise elle ouvre la barriere,
> Chante un vainqueur poudreux au bout de la carriere;
> Mene Achille sanglant au bords du Simoïs
> Ou fait flechir l'Escaut sous le joug de Louis.
> Tantôt comme une abeille ardente à son ouvrage
> Elle s'en va de fleurs dépouiller le rivage:
> Elle peint les festins, les danses & les ris,
> Vante un baiser cueilli sur les levres d'Iris,
> Qui mollement résiste & par un doux caprice
> Quelquefois le refuse, afin qu'on le ravisse.
> Son style impetueux souvent marche au hasard.
> Chez elle un beau desordre est un effet de l'art,
> Loin ces rimeurs craintifs, dont l'esprit phlegmatique
> Garde dans ses fureurs un ordre didactique:
> Qui chantant d'un heros les progrès éclatans,
> Maigres historiens, suivront l'ordre des temps.
> Apollon de son feu leur fut toujours avare, &c.

> The lofty ode demands the strongest fire,
> For there the muse all Phœbus must inspire:
> Mounting to heav'n in her ambitious flight,
> Amongst the gods and heroes takes delight;
> Of Pisa's wrestlers tells the sinewy force,
> And sings the dusty conqueror's glorious course;

To

To Simois' banks now fierce Achilles ſends,
Beneath the Gallic yoke now Eſcaut bends;
Sometimes ſhe flies, like an induſtrious bee,
And robs the flow'rs by nature's chemiſtry;
Deſcribes the ſhepherds dances, feaſts, and bliſs,
And boaſts from Phillis to ſurpriſe a kiſs,
When gently ſhe reſiſts with feign'd remorſe,
That what ſhe grants may ſeem to be by force.
Her generous ſtyle will oft at random ſtart,
And by a brave diſorder ſhow her art;
Unlike thoſe fearful poets whoſe cold rhyme
In all their raptures keeps exacteſt time,
Who ſing th' illuſtrious hero's mighty praiſe,
Dry journaliſts, by terms of weeks and days;
To theſe, Apollo, thrifty of his fire,
Denies a place in the Pierian choir, &c.

SOAMES.

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